THE

ELECTRICAL REVIEW.

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ELECTRICAL REVIEW.

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(J. A. BERLY'S).

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GERMAN REDUCTION IN WIRE LAMP PRICES.

A BREAK-UP of the prices of metallic-filament lamps has just commenced in Germany. On the one hand the collapse is attributed to the action of the Deutsche Gasglulicht (Auer) Gesellschaft in proposing to increase its share capital from £650,000 to £1,300,000 for the purpose of developing the incandescent gas mantle departments in consequence of the prevalence of stronger competition, and at the same time announcing that the growing rivalry in the metallic-filament lamp trade would render it necessary for the company to promote the bulk manufacture of Osram lamps in view of the prospective reductions in prices. But the hostility created by the scheme for doubling the share capital caused the directors to withdraw it a few days after its publication, although they intimate that the development of the wire lamp department will be proceeded with without raising the share capital. On the other hand, the A.E.G., which has taken the lead in the lowering of prices, is stated to have had such a step in contemplation for some time past. It is unnecessary for us to inquire which version represents the exact state of affairs. Certain it is that the reductions were not announced until the Gasglulicht Gesellschaft, which is claimed to be the oldest manufacturer of wire lamps, intimated to its shareholders the intention to undertake such a large capital expansion. The price concessions made by the A.E.G., which were first published on February 3rd, are operative from the first day of the month, and range from 10 to 15 per cent.

At present the German market for wire lamps is actually in a stage of transition which, it is contended, necessitates the exercise of a certain caution in forming an opinion of it. Notwithstanding their comparatively high cost, the wire lamps have rapidly obtained a large sale, and it would appear from the circular issued by the A.E.G. to its customers that the price reduction is intended to be the means of ousting carbon-filament lamps to a far greater extent than has hitherto been the case, especially as the popularisation of the metallic-filament lamp has been one of the favourite plans of Herr Rathenau, the general director of the company, for some time past. The wire lamp has changed the whole illuminating practice very much in favour of the electric light instead of gas. In Germany the demand is at present so large that all the factories are sufficiently provided with orders to find full employment, and the before-mentioned makers, leaving the others out of consideration, almost dominate the market. Hitherto they have in general adhered to about the same basis prices, without making any formal arrangements such as have existed in the carbon-filament lamp branch, under the auspices of the Glow Lamp Syndicate, for a number of years past. The market has, in fact, not been suitable for an agreement which would result in a limitation of various interests, as the

trade is still very much in a stage of development, especially as some of the factories have been in course of extension and have not yet reached the intended productive capacity. When this stage has been attained and when a certain stability has been established between output and demand, it will be possible to enter into arrangements as to markets or volume of production as affecting the principal makers. The absence of any understanding in this direction in Germany, has, however, led to rapid extensions of wire lamp factories, and the probability of over-production will have to be reckoned with in the future, which would further unfavourably influence the course of prices from the makers' point of view.

The conditions in markets outside of Germany are represented by a rapid retrogression in prices. This is chiefly due, it is stated, to the circumstance that a Dutch firm at Eindhoven is offering very keen competition as a result of a large extension of factories which has recently been carried out. It is said that the firm now proposes to proceed with further extensions, which would hardly permit of a peaceful shaping of the export markets from the German standpoint. It is, therefore, thought that export markets will scarcely develop favourably for German makers, especially having regard to the conditions of freight, duty, &c. In addition to this the fragility of the metallic filament, involving a high risk of breakage, comes into consideration in the foreign trade. The risk was formerly borne by the receiver of the lamps, but it now has more and more to be undertaken by the makers, although the level of export prices is already regarded as inadequate.

Electroplating Made Easy.

Elsewhere in this issue we give a brief report of a paper read before the Society of Arts by Mr. A. Rosenberg, on a method of plating with powders, which should prove of very extended utility. It is not, of course, suggested that the process can ever entirely replace ordinary electroplating, because a well-plated article—whether silver or nickelplated—has on it a deposit of very appreciable, indeed, of quite tangible thickness, whereas it seems to us that to deposit such a film by the "Galvanit" process will require a length of time and a quantity of a comparatively expensive material that puts the process out of court as far as cost is concerned. This, of course, is a matter which only experience, or definite quantitative experiments, can decide. Unfortunately, the Society of Arts paper contained no record of the latter. It must not be forgotten that the process is in reality a voltaic one, in which the fuel consumed is the expensive metal magnesium, and for thick coatings—quite apart from the question of time and labour—the use of equivalent quantities of this metal does not at first sight seem to be a commercial proposition for heavy electro-depositing on an industrial scale. This does not mean that the process will be of no practical value. On the contrary, it will probably have very extended uses, but it seems likely that these will be confined to such domestic purposes as keeping in good condition the tinning on cooking utensils, or what is more important, ordinary silver plate, to which the *addition* of a very thin film of silver, say, once a week (instead of the *loss* of silver, which is the inevitable result of applying the ordinary polishing powder), is all that is required to keep the ware in a state of perpetual renovation. In any case, the process is one of considerable novelty and interest, and only prolonged experience can ultimately decide how far its practical application can extend.

Electric Traction on the L.B. & S.C. Railway.

We have all been awaiting—railway directors and electrical engineers alike—with keen interest the completion and, above all, the working results of the electrical section of the L.B. & S.C. Railway between London Bridge and Victoria. The electrical service commenced on December 1st, 1909, and has, therefore, been in operation only two complete months; yet we learn with the greatest pleasure from the speech of the chairman at the recent meeting of the company that the effect of the conversion not only was immediate, but has been progressive and maintained. In the first week there was an increase of over 40,000 passengers, and there has been a steady and continuous increase ever since, the total increase for the two months, as compared with the previous year, being 440,536, or over 62 per cent., while the increase in the second month was 71 per cent. Moreover, there has been no breakdown of any consequence from the opening day, and the chairman claims that in no other instance has an electric service, established on an ordinary steam railway, worked so smoothly and uninterruptedly from the commencement. Nearly the whole of the traffic previously lost to the tramways and motor-'buses has been recovered in two months, and the directors are already considering the advisability of extending the system. Credit is given by the chairman to the principal contractors—the A.E.G. Co.—who supplied the motors, and to their sub-contractors, Messrs. R. W. Blackwell & Co., who equipped the line, while the Metropolitan Amalgamated Carriage Co. made the rolling stock; Mr. Philip Dawson, who recommended the single-phase system and carried the work to its successful completion, merits the thanks, not only of the company, but of the electrical industry, for if the results already recorded are maintained, as we do not doubt they will be, a great impetus will be given to the electrification of our suburban railways in the near future.

Trade in January.

The export trade of the United Kingdom during January showed the very substantial improvement of 20 per cent. as compared with the corresponding month of 1909, while the imports were better by 4·5 per cent., and the re-exports by 21·8 per cent. The imports of electrical goods showed a decrease of £11,437 for the month, being £109,471 as compared with £120,908. The exports of electrical goods and apparatus, other than machinery and telegraph and telephone wire, were £155,074, against £126,307 in January, 1909, an increase of £28,767.

This is an excellent beginning for the year 1910, and there are tangible signs that so far as electrical exporting is concerned the improvement will continue. We have recently had an opportunity of noting in the Midland manufacturing districts a very healthy industrial activity and a great hopefulness as to volume of business expected during the current year. Overtime and double-shift working has been necessitated in some cases to cope with the increased business, much of which is for export orders. In Sheffield, too, where business during the greater part of last year was seriously affected by the lack of confidence, the optimistic spirit is now abroad. The local Chamber of Commerce in its annual report refers to the considerable improvement which occurred in the Sheffield export trade during the last quarter of 1909, and adds that "undoubtedly more hopeful feeling exists as to the prospects of 1910."

It's an Ill Wind, &c.—It is reported that as a result of the inundations in France, large orders are expected to be received by German manufacturers, and as a consequence speculators on the Berlin Stock Exchange have forced up the prices of cement and electrical securities. It is even narrated that the A.E.G. has dispatched a number of officials to Paris, and the Stock Exchange has already interpreted this rumour as implying the receipt of extensive orders for the electrical industry from Paris. Where do *we* come in?

CORRESPONDENCE.

Letters received by us after 5 P.M. ON TUESDAY *cannot appear until the following week. Correspondents should forward their communications at the earliest possible moment. No letter can be published unless we have the writer's name and address in our possession.*

Protection! from Whom?

Your correspondent "Ex-communicated" (is there any inner meaning in the *nom de plume*?) is evidently somewhat perturbed at the outspoken nature and frank criticism of the above article.

But on his own admission he felt somewhat doubtful as to the views of others, and the writer is quite satisfied that industrial and manufacturing England, at any rate, has given a decided expression of opinion on the subject under discussion.

The intention was, however, plainly to point out internal weaknesses which no measure of Protection could be claimed, or expected, to alleviate. If your correspondent's letter is intended to be an exposure of "obviously untrue and misleading"—"statements of facts"—I leave it to your readers to say if he has succeeded in his effort. In my opinion he fails lamentably. As an exponent of the policy of import duties, I find nothing definite or convincing in his letter. He has apparently to rely on the plate-glass trade for evidence. This is not a parallel case at all, and does not in the least influence us, while he has no real destructive criticism to advance. Moreover, the article was clearly not discussing the position of our industry in the last century, but that of matters as they stand with us to-day.

If your correspondent examines the article again, he will find that every credit has been given to English designers and inventors. But no one can gainsay the fact that many of the most important inventions of recent years were not of British origin, and it is largely due to this fact that our imports of electrical material (though almost stationary) are as large as they are. If "Ex-communicated" will refer to the Board of Trade returns for last year, together with the returns of the Census of Production Act, 1906, he will find a mass of very interesting information, which largely goes to confirm the writer's views.

For instance, he will find that the total value of electrical goods imported in 1909 was £1,855,246 (deduct re-exports, £168,521); of this total no less than £438,906 consisted of glow lamps, of which, without doubt, a very large proportion were of the metallic-filament type, and of relatively high value. Arc and searchlights, accounted for apparently about £84,696, carbons £141,469, while telephone apparatus, &c., amounted to £166,790.

I have already discussed the position with regard to incandescent and arc lamps. As to arc lamp carbons, for various reasons we have never been able to secure this trade, and I, personally, very much doubt if the imposition of a 10 per cent. duty will enable us to do so. With respect to telephone apparatus, &c., the state of affairs is well known, and a welcome improvement is to be recorded, our imports of this class of material showing a consistent decline. The total imports of goods classed as "Electrical Machinery" amount to less than £500,000, which compares with a total home production of over £4,000,000, according to the returns referred to.

So that bearing in mind that a great deal of the imported material is doubtless of special and patented design, my contention that the severest competition comes from home manufacturers is fully borne out by the figures.

Your correspondent's supposition with regard to the exact interest of the writer in electrical manufacturing is answered in the article itself. For his further information, I may say that I have travelled perhaps as much as most of us, but do not bring forward my experiences of 20 years ago when discussing the position as it is to-day.

I decline to accept the view of "Ex-communicated" that the foreigner importing electrical material into England would pay the duties. Analysing the returns given, I shrewdly suspect that it will not come out of his pocket at all. Does anyone imagine that the importers of metallic-filament lamps, arc lamps, &c., during 1909 would have paid the duty if such were enforced?

I pass over the suggested personalities of the letter under reply, which only weaken whatever case your correspondent may have, and still remain unconvinced that the salvation of the electrical industry will be accomplished by the imposition of a protective tariff of whatever magnitude.

The article was intended to state fearlessly what were, in my opinion, some of our difficulties, and it was to be expected that many would be in disagreement with the opinions expressed. I, for one, would be gratified to see a real and definite exposition of the case for a tariff in our industry, backed by argument, not generalities, and right up-to-date.

The Writer of the Article.

Cinematographs.

The Secretary for Scotland has just issued regulations regarding the use of arcs for cinematograph entertainments in public halls, &c., and I presume similar rules will be issued relative to England.

These regulations require the cinematograph apparatus to be placed in a fireproof chamber, which is only right and proper, but when they go on to state that no electric current shall be used within the fireproof enclosure at a higher voltage than 110, they surely become most unnecessarily stringent.

Practically every public supply in Scotland is at 220 volts or over, and it is customary to supply current for these cinematograph arcs direct from the town supply through line resistances. If these resistances are placed outside the enclosure, the danger to the operator is practically nil, although the voltage inside the chamber may be 220 or more when on open circuit. These resistances are usually supplied by the owners of the cinematographs, and the expense to the hall owner in making arrangements for the connection is small, but if these regulations are enforced, they will greatly restrict the number of halls where these entertainments can be given, and add greatly to the cost. A motor-generator of some kind will be necessary where D.C. is supplied, and although no doubt a motor-generator is more economical in actual use than a line resistance, the capital cost and the care necessary to keep it in order will necessitate higher charges for its use unless a great number of exhibitions are given per annum. As the regulations stand the fire-proof chamber cannot even be lighted internally from the ordinary town supply direct.

As cinematographs must be a source of considerable income to electrical undertakings, I think some of the influential electrical engineering bodies should take the matter up with a view to seeing if something cannot be done to bring the regulation regarding voltage in line with the ordinary Board of Trade Regulations regarding the use of electricity in dwelling houses and factories.

Uniformity.

Combined Lighting and Power Meter.

We have read with considerable amusement the remarks by the meter department of Simplex Conduits, Ltd., in their letter which appeared in your issue on January 28th, wherein they referred to our combined lighting and power meter as another old friend, generally known as the three-wire system.

If the meter department in question will again read through your description and examine the diagram more closely, we feel sure they will see that it cannot in any sense of the word function as a three-wire meter.

However, as they may not be acquainted with the operation of a three-wire meter, we would trespass on your space and give them a short description of this system.

In a three-wire meter the one main current coil is used in series with the one outer of the three-wire system, and the other main current coil in series with the second outer so that the current taken by one-half of the system, *quite irrespective of the type of load, heating or lighting* flows through one-half of the meter and the current taken by the other half of the system flows through the second half.

The meter then registers the total three-wire consumption, but has nothing to do with charges for lighting or power.

In terming our meter a three-wire meter they were probably misled by the coils being split up in the ratio of two to one, and in consequence the power terminal of the meter is shown connected to one-half of the total series turns. The lighting current therefore flows through all the series turns, whereas the current utilised for heating or other domestic appliances only flows through that proportion of the series coils which is in the ratio of the heating to the lighting rates.

We should like to point out that the connections of the power terminal to the series turns depend entirely on the ratio of the charges, and as regards the adjustment of the meter there is no difficulty whatsoever respecting the ratio of the lighting and power rates.

We, of course, can arrange not only our watt-hour meter, but also our ampere-hour meters for the same purpose, as dealt with by Simplex Conduits in their fig. 2.

With reference to their concluding remark, that no special type of meter is essential, we wish to point out that the ordinary meter cannot be used for this purpose, as the meters have to be adjusted to the exact ratios, and this involves not only special terminals, but also special calibration.

Adnil Electric Co., Ltd.
R. A. Marples, *Manager.*

London, E.C., *February 1st*, 1910.

Disposal of Sawdust.

I have the opportunity of supplying current for power to some timber merchants provided that some means can be devised for disposing of the shavings and sawdust which they have hitherto burnt for the purpose of raising steam. It is not feasible to burn this in our boilers, and there being no other market for them, the place would very soon become congested.

As this probably may have arisen in other places, I shall be glad to have any suggestions which you or your readers can make. Would it be possible to make wood pulp on a small scale? and, if so, can you give me any particulars?

The quantity of shavings and sawdust available at this particular mill would be about a ton a day, but there would, of course, be considerably more than this available in Norwich altogether.

F. M. Long,
City Electrical Engineer.

Norwich, *January 19th*, 1910.

Brighton Railway Smash.

There is one feature of the above accident which, so far as I am aware, has not been commented upon in the Press—I refer to the fact that the wreckage did not take fire.

I believe I am right when I state that this train was illuminated throughout by electricity, and, therefore, the risk of fire was reduced to an absolute minimum.

Had the wreckage taken fire, as has generally occurred in accidents of this sort, the death roll would have been much higher, and as electricity has figured rather prominently in some recent fires, I think that it is only right that attention should be drawn to its "safe" properties as an illuminant for train lighting.

Interested.

The Single-Phase Motor.

Mr. Williams-Ellis, in his interesting letter in your last week's issue, is rather enthusiastic in his advocacy of the "Cascade" motor, and rather sweeping in his condemnation of the single-phase motor.

If "Advocate" has the choice of three-phase or single-phase supply, the writer agrees with Mr. Williams-Ellis that three-phase is preferable.

As regards the choice of motor in the case of three-phase supply, one would naturally think that the initial cost would have some influence with "Advocate," and it seems to the writer that, in the case cited of a motor being in an inaccessible position, a 950-R P.M. motor, even with slip rings, and automatic brush lifting and short-circuiting device, would be considerably cheaper than the 492-R P.M. "Cascade" motor mentioned.

Regarding the progress made in single-phase motor work—there are several firms manufacturing various types of single-phase motors, which seem to the writer to meet very well most requirements. In the front rank in this branch is the firm of Rhodes Motors, Ltd., of Doncaster, who make, among other types, the following:—

(*a*) An induction motor arranged to start up as a repulsion motor, giving full load starting torque with full load current, and twice full load starting torque with twice full load current, the working characteristics, power factor, efficiency and overload capacity, being those of a well designed induction motor.

This motor can be started up against the above loads by simply closing an ordinary D.P. switch, and would meet the case cited by Mr. Williams-Ellis, viz., where the motor is inaccessible.

Furthermore, this machine is capable of perfect speed regulation at starting if a controller be used.

(*b*) A similar motor to (*a*), but provided with a special winding for reversing, a simple change-over switch being all the gear necessary.

This machine will give starting torques similar to (*a*), but in both directions.

(*c*) A pure repulsion motor with all the characteristics of the D.C. series wound crane motor—an ideal motor for crane work.

The latest type of single-phase motor, just patented and placed on the market by this firm, is especially suited for large power motor work. This machine, essentially an induction motor as regards running characteristics, is arranged so that by the closing of one side of a change-over switch, it can be started up against one-third to half full load starting torque with a current consumption of not more than half full-load current, other starting torques being somewhat proportional, changing over the switch for working.

It would be interesting if some of those engaged in single-phase motor development would give their views.

W. Rae Joss.

Doncaster, *February 2nd*, 1910.

Greenock Destructor.

I have observed with surprise the belated and somewhat extraordinary letter of Mr. A. J. Abraham relative to this plant.

It is not quite clear whether it is the Greenock destructor itself or Mr. Robertson, the electrical engineer in charge of the plant, and the author of the paper quoted, that is *bête noir* to Mr. Abraham; but he certainly goes out of his way to deal with both in a most splenetic manner and with a wealth of cheap heroics.

Mr. Robertson's paper on "Electricity Works and Refuse Destructors" was read at Glasgow on April 13th last; it was reported at varying length in the various newspapers. It was also honoured with a *verbatim* report in one at least of the professional papers, and with slight curtailment in others, and it does seem a little queer that Mr. Abraham should have nursed his wrath all these months only to break out now with a communication, the tone of which, whatever the merits of the case are, does not leave upon the reader the impression of disinterestedness or good feeling.

Mr. Robertson's paper was a contribution to an interesting and important subject by one who has had an exceptional opportunity of approaching it with an open mind, and in his paper, while he was dealing with a destructor of a particular type and make, exhibited no partisan spirit. Indeed, he was generous in his appreciation of points of detail in the construction of types of destructors by makers other than that of his own particular plant. This, I think, was admitted by parties taking part in the discussion who were openly championing the cause of particular firms and their methods.

It is perfectly obvious that Mr. Abraham has never seen the Greenock destructor, and knows little about it. For instance, observe his statement that "Mr. Robertson finds it necessary to use stand-by coal-fired boilers to keep his

pressure steady at the engines." Mr. Robertson does not find anything of the sort necessary. There are no coal-fired boilers in connection with the destructor plant. The only coal-fired boilers are those attached to the electrical generating station, of which the destructor is only an adjunct. The total output of electricity from the station is about 3½ million units per annum, and of this total about a third is raised by destructor steam. The destructor is an adjunct of the electrical station, not the station to the destructor, as Mr. Abraham seems to think. Hence the reason for the coal-fired boilers.

Mr. Abraham's nine months' study of Mr. Robertson's paper does not appear to have been conducted in that dispassionate frame of mind which should be brought to bear upon all honest and fair contributions towards any question of professional or public importance. I cannot help feeling, after a perusal of Mr. Abraham's epistle, that he has quite deliberately set himself the evidently congenial task, for the purpose of making himself aggressive, of giving a twist to, and placing a construction upon, Mr. Robertson's words and facts, not usually associated with fair and reasonable criticism.

But why should the custodian of a humble little village destructor come forward at this late hour to paint himself and his own small particular plant in such brilliant colours? Was it native pride that made him scorn to be overshadowed by a newer, larger and more notable destructor—an installation which has engaged the attention of authorities all over the country, and has been visited by experts from all over the world? Surely this were pride and vainglory run riot. No; the idea is not to be entertained. What, then, could be the set purpose of this belated communication? Simply this: It was written for extraction, transmission and advertisement purposes, in view of two or three contracts for destructors being imminent.

N. B.

Mysterious Kicks.

In reply to your correspondent "X," I can only infer that his trouble is due to disturbances in the balance of the system. Any sudden load thrown upon the opposite side of the three-wire system, such, for instance, as the starting up of a motor, would, I think, explain the upward "kick," for in a long cable (viz., four miles) a sudden demand upon one side of the hitherto balanced system would cause that side to fall in pressure and the other side to rise because of the drop in voltage along the neutral cable. I would, therefore, suggest that he connect up the recording voltmeter to the opposite side of the system, and in the same locality as before, when, if my supposition be correct, he will obtain similar pressure "kicks," but in a downward direction.

Of course any sudden disturbance in a middle wire or its connections would encourage like phenomena.

If the instrument be at fault, then the "kicks" will be noticed on whichever side of the system it be connected, and in such a case the trouble will most likely be due to temporary shorting of some of the resistance coils of the instrument (presuming it to be a moving-coil instrument).

I should be most interested to hear the verdict when the mystery is solved.

W. F.

The Straight Tip.

It appears to me to be an impossibility to prevent the malpractices you mention under this heading. If a supply authority employs canvassers, and has a showroom, but does no wiring or selling of apparatus, can you tell me what possible use the canvassers are? Surely a canvasser is a man out to get business. He gets hold of a prospective consumer, who is interested in electric lighting and so on, gets him to a certain point and then has to tell him that if he wants electricity installed he has got to find out for himself all about the people who do it, as he, the canvasser, is not allowed to recommend any contractor or manufacturer.

Can you tell me in one of your useful notes you sometimes put at the bottom of letters, what a prospective consumer is bound to think of this method of attempting to obtain his business? Would you not, as a business man, if approached in this way, and having become interested, be disgusted with electricity, and all business connected therewith?

Would it not be very much better to shut down the canvassers and the showrooms until some way out of this idiotic position, that many supply authorities find themselves in, is found? I should say emphatically, yes, rather do this than continue to let the public see what incompetent, unbusinesslike arrangements prevail in electricity supply.

I would ask one more question: Is not the whole Dublin case you mention an illustration of the fact that if the supply authority *does its own wiring*, and supplies apparatus itself, there would be no inducement to shady practices, because canvassers would then be canvassing not only for units, but for installations?

A. Hugh Seabrook,
General Manager.

St. Marylebone Electric Supply.
February 5th, 1910.

[Could not the canvasser provide the prospective consumer with a printed slip giving the names and addresses of all the local contractors of good standing?—Eds. E.R.]

Find the Pole.

It seems like yesterday that the whole world was excited over the discovery of the North Pole and the near approach to the South Pole; but who ever heard of the Centre Pole, and that it was to be found in West Bromwich?

What with Peary's Pole and Shackleton's Pole, the recent election Poll, and the new game of "Find the Pole," recently introduced by the B.E.T., the folks in the Black Country are quite polarised. Recently in the tramcars worked by the company, could be found bills posted in the windows setting forth the rules of the new game to come into force at the fall of the year, in which all passengers were invited to take part.

They began by calling it the Fair Fare system, but it has developed into a pastime indicated in the title of this letter. The rules were printed in small type, and the bills put in such awkward positions that it was almost impossible to read them unless one's head was set on a universal joint, or one used a telescope. One gentleman attempted to rest his chin on the shoulder of a lady opposite, but the lady objected.

Now, the centre pole is to be found in West Bromwich; in fact, there is a row of them, two miles long, extending up the centre of the principal thoroughfare from Wednesbury to Handsworth. The new game commences by the passenger entering the car at any point. The conductor promptly punches him a penny ticket, which covers four farthing stages of so many poles each. There appears to be nothing less than "four" in the game, so that if the passenger only wants three farthings' worth the company scores "one."

After the ticket has been exchanged for a penny, counting begins. The poles are distinguished by neatly painted waistbands, some white, some black, and each bears a number. The desire is to find the pole at which the penny ticket expires. Counting takes place silently, possibly from a desire on the part of the passengers not to interrupt each other; all the while the eagle eye of the conductor roams up one row of silent passengers with moving lips ready to pounce on the first unfortunate who passes the pole, and punches and delivers another ticket.

Under the new scale 1½d. is in many cases charged against a previous penny. This, for instance, occurs on the road from West Bromwich to Oldbury, a thoroughfare which crosses the railways at right angles, and forms the only means of communication between the two towns. It is in this section that the feeling is, perhaps, strongest. The route has been divided into five farthing sections. When four have been traversed, the passenger must either descend and complete the journey on foot or pay another 1d. for conveyance over the few remaining hundred yards. The same thing occurs on the return journey, so that what once cost 2d. is now 4d. With few exceptions, there appear to be no tickets under 1d.

This is only one example of the serious and universal complaints. The matter has been taken up by the public

and by the local authorities. Everyone seems tired of the new game, except the tramway company, but it remains to be seen how they will fare when the public stop playing. This is just what is happening.

In West Bromwich, under the leadership of Dr. Scott, a movement involving a boycott of the trams has been started, and has for its object the following :—

1. An absolute boycott of the cars.

2. Never getting on or off a moving car, so that the company's electricity bill may be increased, and

3. Continued protest against the overcrowding of cars.

The boycott has been enthusiastically taken up by the tramways' late patrons.

Resolutions of protest have been passed by the Oldbury District Council and the West Bromwich Corporation. The Mayor of Smethwick has shown his sympathy by granting the free use of the Town Hall for a meeting of protest this week.

In Tipton, Wednesbury and Darlaston the feeling is strong against the new innovation. A form of pledge is being signed by the thousand, as follows :—"I solemnly promise not to use the trams of this district for three months, or until the boycott is removed by the Committee, or until the old fares, including the children's half fares, are resumed, unless circumstances absolutely compel me."

It will be seen that the promoters of the movement not only demand a return to the old fares but the resumption of half fares for children.

Canvassing is taking place under the superintendence of two responsible citizens in each ward, helped by numerous willing assistants. There is no difficulty in getting signatures; in fact, there is an eagerness to "sign the pledge," and those who ought to know predict at least 10,000 signatures.

The tram system has proved a blessing in the Black Country, the service and fares being popular. The railway companies felt its inroads in their local traffic, and rather late in the day considerately increased travelling facilities by establishing motor trains with frequent stopping places, at popular fares, and the present seems an inopportune moment to upset the tram patrons for the undoubted benefit of the railway companies.

J. Hardie McLean.

Great Barr, *February 6th*, 1910.

The Heurtley Test and Cable-Fault Localisation.

With reference to Mr. Raymond-Barker's letter in your issue of January 7th, I trust it is understood that I did not write with the idea of adversely criticising his admirable articles, but rather with the desire of making these said articles still more generally useful by correcting an obvious slip, and suggesting what seemed to me a possible explanation and remedy for occasional discrepancies in this method of testing, which discrepancies have been noted before now by several workers, including myself. The remainder of this letter is written solely with this utilitarian end in view.

The following are my reasons in detail for believing that, in spite of Mr. Raymond-Barker's affirmation to the contrary, there was nothing abnormal in the actual exposure under consideration :—

1. If there was a constant resistance in the actual exposure then this would have affected the results obtained with the other testing methods; this, however, was not the case.

2. On page 831 of your issue, Mr. Raymond-Barker mentions that in order to obtain a balance, he found it necessary to use an artificial exposure of fully 12 in. of Cu wire, and this to balance "a small perforation (approximately 1 sq. mm.)." This, in conjunction with the fact that he had to unplug in his balancing arm approximately 19 ohms more ohmic resistance than the copper resistance up to the actual defect, is sufficient proof, in the writer's opinion, that there was nothing either abnormally high or low in the resistance of the actual exposure.

This being allowed, the cause of the discrepancy must be looked for in the different rates of resistance variation with the current of the actual and artificial exposures. As the ordinary triple and dual tests, by giving true results, showed that the actual exposure was behaving normally, we are finally lead to look for the cause of the defect in the peculiar conditions of this peculiar test. In the writer's opinion the most satisfactory explanation still seems to be that detailed in his letter published in your issue of December 24th, and which was suggested to the writer by Mr. Raymond-Barker's articles.

With reference to this it would be interesting to know what were the final results of tests 4 and 5, tabulated in Mr. Raymond-Barker's article on page 755 of your issue of last November; the results might throw corroborative evidence or otherwise on the explanation advanced by the writer.

The writer regrets that he has not time at present to test the correctness of this theory, though the practical proof could be obtained by a few simple and obvious experiments.

The writer believes that if the remedy for these occasional discrepancies has been found, it will place this test in the front rank for general utility through a tremendous range of conditions.

Apologising for taking up so much of your valuable space,

E. S. Heurtley.

P.S.—It seems improbable that close proximity of the earth connection to the artificial exposure in the case under review would have at all improved matters.

Montreal, *January 20th*, 1910.

Cost of Living in the Malay States.

In answer to "Precision's" remarks in your issue of December 17th, 1909, I cannot but think that his experience is limited to Singapore only; he seems to forget the possibility of conditions being somewhat different in other parts of the Settlements.

In the native States, where most of the developments are going on, one finds living much cheaper than elsewhere, but my cost of living, as given in the article, does not show either the least one could live on, or the most, and as it is quite possible to live as extravagantly as one likes, or otherwise, I tried to make the article as useful as possible, by taking an average of the cost of living in the native States, Penang and Singapore.

In my opinion "Precision" has exaggerated somewhat the cost of living, and to such as he the article is not addressed. I also maintain that the "Griffin" can live, at the outset, on the lines laid down, until, like most people in the Colonies, he will assume an extravagance which is the usual accompaniment to life in such a climate as that of the Straits Settlements.

The Writer of the Article.

Searchlights Wanted.

Is it not time that the exceedingly useful searchlights supplied to the army and so easily moved about from one place to another were supplied to signal boxes and breakdown gangs on railways, and to coastguards? I fancy that the work of breakdown gangs working at night to rescue victims of railway accidents and of coastguards rescuing souls from wrecks should not be obstructed by the absence of portable and ultra-powerful searchlights. What do your readers think?

Henry James Saint Benno Cunliffe, M.A., Oxon.

London, *February 3rd*, 1910.

Contractor or Manufacturer?

Your correspondent, "One of the Much Maligned Electrical Contractors," writing under the above heading, does not apparently take my letter of the 11th ult. very kindly, and from a fertile imagination, conceives all sorts of purely hypothetical objections to sales departments.

I quite agree that sales departments who inform prospective consumers that electric wiring can be done at or below 10s. per point are somewhat of a nuisance, but a department which quotes such prices as that cannot last very long, for the establishment charges in connection with a sales depart-

ment must be at least as high as in a contractor's business, and I hold no brief for sales departments that are subsidised from revenue derived from the electricity supply. In fact, I would lend all the aid I can command to those who are intent on keeping up prices of electrical apparatus to consumers, to allow of a reasonable margin to cover profit and establishment charges.

I would say, in passing, that the too prevalent practice of allowing discount to non-trade people is much to be deplored. I believe it to be against the general electrical interest.

"Maligned," however, misses the main point of my letter. I said, and I say again, that the average contractor is neither technically, financially, or in business capability, strong enough to efficiently take advantage of the possibilities of electrical development.

How many contractors are enterprising enough to employ experts on heating, cooking, lighting, special forms of power and such like, and how many are enterprising enough to employ a staff of really good salesmen?

The large and well-established contractor is, as a rule, quite capable of carrying out, and does carry out, good electrical work, but it is the exception rather than the rule to find a contractor who will create work, who will get into touch with possible consumers, and interest them in an electric supply, and interesting them, will afterwards get their business.

It is in business getting that the contractor fails, and because he is not so efficient a business getter as a well-organised sales department, is one of the chief reasons that sales departments are coming rapidly to the fore.

For some years it has been my experience that the consumer prefers to deal with the electricity suppliers for the whole of his electrical needs, for, contrary to "Maligned's" opinion, the consumer believes he will get redress much more readily from a firm which does the whole of his electrical business than he will if he divides his custom with the contractor for his wiring and supply of fittings, and the supply authority for his supply of electricity.

How often it is the case that the contractor puts the blame on the shoulders of the supply authority, and the supply authority puts the blame on the shoulders of the contractor, and between the two of them the consumer gets left.

Electric supply monopolies, conducted on a business basis, are bound to encourage improvements. They have a name to win or a name to lose, and a business to extend. Extension of business can only be obtained by giving increasing value for money.

Experience shows that where sales departments are started on businesslike lines, not only do kilowatts connected increase considerably, but the sales department being in close touch with, and a part of, the supply authority, develops the business in such a way that the load factor is improved.

There can be no doubt that the present and prospective electricity consumer has not had sufficient attention paid him in the past. The supply authority has depended on the contractor to bring in the business. The contractor has brought in just as much business as he cared to do without reference to the ultimate possibilities, and has left the smaller stuff to chance. This smaller stuff, such as irons, kettles, hat pads, grills, and such like, is most important to the supply authority in view of the decreased revenue per consumer due to metal-filament lamps. I do not believe that it pays the average contractor to sell these small accessories, and, apart from his lack of business-getting capabilities, he cannot be blamed, for he is unable to buy so largely as a supply authority, and in consequence cannot command so large a discount. Salesmanship is needed to sell these accessories, and the selling cost is high.

The matter can be taken further. The consumer is the origin of the demand for not only electrical accessories, but also for electrical plant, and if his electrical needs be developed one will hear less of the depression in the electrical industry in this country.

In conclusion, I fail to see why I should be accused of Socialistic tendencies. If I happened to be employed by a company instead of a municipality, would the pushing of a sales department be sufficient to dub me Socialist? The matter is purely one of business.

The problem is, How best to increase output quickly and on the right lines? The answer is, By the science of systematic "business getting," a science of which the electrical contractor is comparatively ignorant; and I am sorry to say that the same remark applies to not a few electric supply engineers.

H. H. Holmes,
Sales Manager.

St. Marylebone Electric Supply,
February 1st, 1910.

Mr. Watson is to be congratulated upon the stand he is taking against the abuse of municipal powers by officials. The great weakness of administration by local authorities lies in the incompetence of committees. It is safe to say that no body of presumably honest men, knowing their business, would permit officials to carry on a campaign of blatant self-advertisement under the guise of commercial development, and at the expense of one section of the community. No one will question the value of a good publicity department, but when such departments are converted into elaborate organisations having apparently for their chief object the glorification of officials, it is time to check a tendency which is rapidly becoming a scandal. Good work can, and has, been done in an unostentatious manner by means of a sane middle course that does not seek to destroy a trade which, despite its alleged failings, has for years borne the heat and burden of the day in the fight against competitors.

Mr. Watson, as a prominent engineer and a councillor, is in an almost unique position to champion the cause of fair play and honest dealing, and it is certain he will have with him the good wishes of the numerous engineers who look with disgust upon measures which are essentially discreditable to the profession.

Justice.

Protection and the Electrical Industry.

Mr. J. Stottner's letter contained in your issue of January 28th would be difficult to beat for the number of false assumptions which it contains. I will not trespass upon your space, of which you have already allowed me a great deal to express myself at some length on views with which I know you do not agree, to point out more than one: The "200,000" do not have to choose between the wages of other countries whether they be higher or whether they be lower, and the wages of this country. Their choice lies between the wages of other countries or the "no wages" of this land of unemployment. Mr. Stottner will remember that I claimed them as part of the unemployed.

A. B. Anderson.

Hollinwood, *February 1st*, 1910.

It would be obviously impossible to answer briefly 7¾ columns of Free Trade argument, but on analysing out the lengthy letters in your issue this week I obtain the following results:—Irrelevant matter, 2¾ columns; pious beliefs, 1½ columns; argument, 2 columns; statement of facts, 1½ columns.

1. With regard to our trade with protected (including Colonial) markets, I notice that the chief arguments for Free Trade are based on the idea that "imports pay for exports."

Now, even neglecting the interest on investments abroad, two vital factors are left out of this idea:—

(*a*) The profit at which the trade is carried on.

(*b*) The character of the goods.

The profits of a foreign manufacturer selling in England are limited only by open competition and his own convenience, while an English manufacturer selling abroad has to face a tariff which may be so adjusted that his usual price is always a wee bit high.

I know of many cases in which manufacturers have had to cut their prices in order to sell at all, and no doubt your correspondents—if they are really engaged in practical business—will have had similar experience.

Again, an export of coal may balance (on paper) an import of watches, motor-cars, &c., but it is obvious that the "labour value" of the latter is vastly greater, and the country producing them benefits.

Hence we can (and do) obtain a large *volume* of trade without a correspondingly great prosperity.

Your correspondents may (if they neglect Colonial Preference) prove a decreased volume of trade as a result of tariffs, but it does not logically follow that either employment or profits would suffer.

2. With regard to the home market, the chief argument seems to be that an increase in prices would lessen the demand.

This would be true if only one trade were protected, but Protection means Protection all round. The maker of steam engines, getting an honest price for his goods, could afford to pay an honest price for a motor to drive his line-shafting.

It is well to remember, too, that a 5 per cent. increase in the customer's outlay may mean a 100 per cent. increase in the manufacturer's net income.

3. With regard to the few neutral markets remaining, the idea (not very definitely expressed) seems to be that we should suffer for not manufacturing so cheaply.

That might be true if price were still the ruling factor, as in Cobden's day; but it seems to me that "live" capital is now the most important thing. During the last 15 years or so, the importance of the large London houses, who will factor anything, has been declining in favour of highly technical development companies.

But subsidiary companies require capital.

Which raises it more readily—a German firm paying at home 13 per cent., or an English one showing a loss?

If by Protection we can make the *Home* trade pay, I do not see what we have to fear in neutral markets.

There are several less important points which space will not permit me to mention—but as there seems to be some confusion as to the objects of Protection, I should like to conclude by stating these, as I understand them, in order of importance:—

(*a*) To exchange our manufactures for other nation's raw material.

(*b*) To carry on trade at prices which can enable all engaged to get an honest living.

(*c*) To raise revenue.

S. E. Glendenning.

Norwich, *February 7th*, 1910.

After reading your note on my letter in which I congratulated you on your adherence to voluntary Protection, I cannot see why you should have written that same note. Are we, or are we not, agreed that public bodies should give preference to British manufactures? If we are, then what is your objection to my calling this voluntary Protection? Do you recognise that at any rate it is not Free Trade? Your correspondents, Mr. Low and Mr. Kingsbury, who know everything about international commerce, must be horrified by your heretical tendencies. Mr. Kingsbury tells you that "To refuse to purchase an article which we can profitably use because it is part of the surplus product of another State, is to refuse a benefit." That is the rigidly logical Free Trade principle. So that when the L.C.C. or the Glasgow Corporation buys British machinery at a higher price than that quoted by a foreigner, and when you and I approve of their preference, we are all defying these cocksure Free Trade Hotgospellers.

They insist that to purchase any foreign article is to create a demand for home labour to an equivalent amount to pay for it. We know better. Neither the humorous little tit-bit paragraphs of Mr. Low, nor Mr. Kingsbury's solemn slabs of controversial concrete, reveal to me that they have made more than a very superficial study of economics, and I really do not know where they will find a political home. For Protection is coming while they argue. One political party will give it us in the shape of Patent Acts, and Development Acts for distributing bounties to deserving industries, will retain the Protective duty which has given us such a fine cocoa trade, and will certainly not buy any more Norwegian granite; while the other party offers us import duties. Personally, I don't care much whether it is bounties or duties we have for a start. But don't let us be hypocrites and wobblers. If we don't believe in Free Trade, let us frankly admit it, and set about planning a better system.

No doubt others will easily expose the fallacies of your verbose Free Trade correspondents. I don't think it worth while. I only want to convert the editors, and if they get any more of those three-column prose epics, I can see them taking drastic measures for the Protection of their space.

T. C. Elder.

Having read the contributions on Protection in your current issue, I would like to give "Free Trader" a few figures, and to show him that the tariff question cannot be dismissed by indulging in a few generalities, and the use of the word undoubtedly.

In "Free Trader's" second paragraph, he quotes from the Census of Production, and expresses his delight that our electrical exports are twice the amount of our imports, and he remarks, "Apparently, therefore, for every £100 worth of goods dumped into this country, we have the audacity to dump over £200 worth abroad." I would refer "Free Trader" to the tables of electrical exports and imports for December, 1909, on page 154 of the Electrical Review. An analysis of these tables shows the fallacy of taking our total exports and imports, and drawing conclusions from them. From the tables our total electrical imports for the month amounted to £199,587, of which Germany accounts for £135,943, the United States for £26,208, and the remainder is made up in small amounts from other European States.

Our total exports for the month amounted to £418,378, of which Germany accounts for £2,991 and the United States for £2,574. Of the total £249,338 goes to British Possessions, £65,060 to Brazil and the Argentine, and £36,091 to Japan. These figures put rather a different complexion on the dumping question, as the tables prove that while we import from European countries and the United States £199,587 worth of electrical goods, we export to these countries only £44,095 worth; or for every £100 worth of imported goods we export to those same countries slightly over £20 worth, a slight difference from "Free Trader's" figure of £200.

His contention that other nations would retaliate fails to impress one in the case of electrical goods, since our exports to European countries (the countries to be affected by our import duty) are individually so small that there would be nothing to retaliate on. His further sentence, "By keeping out foreign imports we shall undoubtedly lose the same value of export trade," shows a very superficial knowledge of the subject. He does not mention a single fact to prove his statement, merely says "undoubtedly"; it may, perhaps, be news to him that Tariff Reformers do not aim at lessening the volume of our imports, but they do aim at changing the character of much of our present import trade from fully manufactured goods to partly manufactured goods, and a greater percentage of raw material. The analysis of the tables effectually refutes his shipping trade contention.

To my mind the analysed figures are so interesting and important that, to say the least, the "advantage of Protection" is worthy of inquiry of a fair and impartial description.

E. F. Rendell.

Wallsend, *February 7th*, 1910.

Your correspondent "C. E." attempts to bolster up a very bad case with a display of equally bad manners.

In the ordinary course one would be content to allow such ridiculous statements as he has made to pass unnoticed, but seeing that you insert his letter, it is presumed that although you may not be responsible for the statements he makes, you, to some extent, agree with them, otherwise one would have expected the usual Editor's note at the bottom.

First of all I know of no manufacturer who is pleased to be satisfied with 2 or 3 per cent. net profits. If he is, he deserves to go where all such should go, that is, the Bankruptcy Court.

In the next place, your correspondent deliberately attempts to deceive your readers. The average import tax on manufactures affecting the electrical trade is only a fraction of the percentage he names. In Germany and

Russia the tax is levied on weight, and the percentage comes out at far less than his figure. The average in the United States is less than half what he names.

For your information, the tax on my goods amounts to about 4 per cent. in Germany, about 8 per cent. in Russia, and about 10 per cent. in France, and as these are the countries which I had in my mind, I am not concerned with any other for the moment. They are, I hope you will admit, sufficiently representative.

Contrary to what your correspondent states, in view of over 20 years' experience of exporting, I say that it is nearly always the custom for merchants to state the country the goods will be exported to. Not only is this the case, but on several occasions quite recently when I have asked for quotations for goods for export, before quoting, the manufacturer has written and asked to what country I intended to send the goods. In one particular case, the manufacturer refused to quote until I had written giving him this information.

If your correspondent doubts these statements, I am prepared to hand £5 to any charity you are pleased to name, if I have made a statement which is false, on condition that your correspondent will do the same if you are satisfied that my statements are substantially correct; and I will even go to the length of allowing you to be sole arbiters in the matter.

Ex-communicated.

February 8th, 1910.

[The fact that we have not appended a note to a particular letter does not by any means imply that we either agree or disagree with its contents.—Eds. E.R.]

As might be expected from a Free Trade journal, the Free Trade side of this correspondence is stated in great detail, but it is necessary to question the accuracy of a good deal of it.

First of all, why should Cobden, who lived so many years ago, be reckoned an expert authority on the present-day world-wide industrial situation, whereas in his day the only industrial situation of any magnitude that could be considered was that of our own nation? We had no competitors worth talking about.

All honour to Cobden and also to the illustrious line of statesmen and others who have endeavoured to show the world that universal Free Trade would be the most paying for England; but the question is, the world-wide position has not matured as they expected. It is impossible to question individually the two principal Free Trade letters, so one must take them in turn.

First of all, take Mr. Low's statement about the selling of old stock at slaughter prices; but he makes an important proviso, namely, provided that it does not interfere with the sales of the ordinary market at full prices. This is just what the Protectionist countries are doing in our markets. They won't interfere with their own ordinary markets at their full prices, but interfere with ours all the time.

With reference to his further statement that "the success of a sales policy is measured by the smallness of the stock carried in proportion to the annual turnover," this is only a very partial truth, for unless you can be sure of your home market, it is a very risky thing to keep your stocks up to the size required for very rapid delivery and quick turnover: therefore the stocks in this country must be small.

A very well-known Government stores officer, with whom I was talking a day or two ago, stated that he was dealing with all classes of electrical manufacturers in this country, and found that the greatest defect in their trading position was the lack of sufficient confidence in their own home market to be able to afford to risk making up stock when the times were slack, as it was impossible with a free market like ours for any manufacturer to estimate what sudden competition he might have to face.

The question of "Rings" or Trusts does not, in my opinion, enter into this problem from a practical point of view, but is a "red herring dragged across the path."

A further interesting statement is that as far as primary economic actions and reactions are concerned, the equilibrium is reached when the loss on exports reduces the profits on home trade to a point that ceases to attract fresh capital. That is not at all the position (or even anticipated position) we have to deal with. It is by reason of Free Trade the profits on the home trade are not sufficient to help to make up any possible losses on the export trade, and therefore we cease to attract fresh capital in this country, but it goes abroad.

I quite agreed with Mr. Low when he says that "exports in the widest sense of the word must be paid by imports in the widest sense of the word," but I, personally, would prefer that a greater proportion of our exports was paid for in gold, thus increasing the amount of gold and the rapidity of its circulation in this country through increased employment of labour.

The resistance offered by a tariff to the return flow of the import trade is, in my opinion, a bogie, and a Free Trade bogie of the worst kind, for it argues that the country from which we receive these imports only orders our manufactures because they can send these goods to this country, which surely is absolutely contrary to the whole idea of Protection as practised by these countries.

I am not interested in the views of Bismarck, Napoleon and Goethe on economics, because even if I allow that their economic abilities were equal to their abilities in other directions (which were proved to be of very high order) they had to deal with a situation which was very different from that of the present day. It is amusing to read Mr. Low asking the business man not to become an economist. To succeed in this country the business man has to be an economist of a very high order, and it is because the economists lay down so many laws and rules on positions and situations of many years in age, that the business man has to take up a branch of economics, which the professional economist and statiticians are trying to warn him off.

In conclusion, as far as Mr. Low is concerned, there is no reason why he should presume certainty of wire-pulling, log-rolling and open corruption, but if extra millions of money would be invested on the strength of any tariff clauses of this country, so much the better for the financial status of the country.

Speaking as a business man, we commercial men do not dally with views of Germany suffering economic defeat by a few lines in our projected Tariff Bill, but we do know that for all our hard work and hard study we are subjected to unfair competition on the fruits of our hardwork and hard study, or else is Mr. Low going to say we are all lazy?

Dealing with "Free Trader's" letter, there are two points which are of interest. Whereas it is possible for every manufacturer in the world to dump stuff into this country, he forgets that owing to the tariff in every other country, dumping becomes an impossibility for us, and therefore his argument will not hold good. If you argue as Free Trader that by keeping out foreign imports we shall undoubtedly lose the same value of export trade, why does not this apply to the protected countries? The principle must be the same, if very high tariff rates keep out our exports; then working on the same lines, we should order less of their goods, but the reason why we do not is that they can do as they like with our imports, and this country's consumer has the questionable advantage of reduced prices for some of his goods on higher internal rates and taxes in order to keep so many unemployed alive.

Now we come to your longest letter, that of Mr. Kingsbury. I do not pretend to deal with the first third of this, as again I must say, I cannot think that Cobden's ideas to-day would be the same as they were so many years ago, when he had a very fine and fundamental idea that if England set the ball of Free Trade going others would be bound to follow. Surely it is not a very difficult thing for Mr. Kingsbury to find out who paid most of the Coal Tax. I do not think anybody can say that shipping rates went up owing to the Coal Tax, or that shipowners' companies' dividends went down for the same reason; so that we may say that the Coal Tax was not paid by English ships or shippers to any great extent. After all, what class of coal is it that is chiefly exported; only that (and it applies to so many of Britain's exports) that people outside this country are bound to have. So that Mr. Kingsbury need not fear for the electrical interests of the North of England, or the Midlands, and the Welsh coal certainly did not suffer owing to the Coal Tax. If I am correctly

informed, I believe it to be a curious fact that one of the principal German houses established over here gets more than its fair share of this colliery electrical work.

One of the principal points of the Free Trader's arguments seems to be that by manufacturing stuff in this country instead of importing it, we shall certainly be hurting our shipping trade. Why does this not apply to the Protectionist countries? If they cannot get enough work for their ships to do, what do they do? Under-cut our rates and get some.

I agree with Mr. Kingsbury about the difficulty of argument, but, in my opinion, the Protectionist mind is far from being as adamant as that of the Free Trader. If the Free Trader's views are based on certain economic laws, they are apparently the laws of the Medes and Persians, and when Mr. Kingsbury talks about the natural flow of trade and commerce, surely that is a most inaccurate statement. Where is the natural flow of trade and commerce when the biggest individual market of all the world is a free one, and the rest of the markets are protected? Is that Cobden's idea? I do not see the use of the "switch and iron" and "lamp and cotton" comparisons. They are not concrete cases, but some of the vaguest of Free Trade theories.

I notice Mr. Kingsbury says that in the case of the foreigner benefiting from an early start in any particular trade, the possible loss of that trade to us should not occasion any surprise, nor should we be sorry about it. Why is it that the other great nations of the world take care to see that their manufacturers shall not have the chance of being sorry? How can it be assumed that, if the foreigner has a leading start in any particular trade and has made a big free market for that particular line, Free Trade can catch up? This is, in my opinion, just what Free Trade cannot do, but what Protection—rightly or wrongly from the economic point of view—can do. I expect to have some examples given me of what Free Trade has done, but my answers are ready for any really good example.

I see it is expected that after our present (I assume it to be present) temporary aberration from sanity, we may be expected to form groups in this country. What good would it be if we did, when immediately a group was formed, and the English manufacturers had decided to sell at fair profit rates, the German importer and Free Trader came along and was content to cut those rates, because it was his export market? Although Mr. Kingsbury practically approves of the German manufacturers forming groups, and our insane English manufacturers to do likewise; he yet finishes that paragraph with the fear of trusts. May I ask, what is the beginning of a trust but a commercial group? I see that it is assumed that if we adopt Protection, there will be first of all insane competition followed by saner combination, but we could get saner combination at once, if we did not have the insane competition which we are now suffering from, and which is at present only due in a very small degree to the home manufacturers.

Why is it, when it comes to the question of duties, that "Free Trader" argues entirely on so-called economic lines, and ignores apparently the natural resources of any country? For it must be admittted that some countries, if their present natural resources continue in the same condition, will be able to manufacture certain classes of articles at an advantage compared with ourselves, and *vice versa*. The practical difficulty of determining when competition is unfair is not at all obvious to manufacturers who really know their business, and the Protection argument is, "Why not lessen the practical difficulty?" It is agreed as to the great similarity of the life of a nation and the life of an individual, and Mr. Kingsbury notices an important difference, namely, that of duration. There is a still more important difference, which Mr. Kingsbury has not stated, and that is, that the life of the individual has an absolute influence on the future life of the nation, and that if you disregard the commencement of commercial and other allied diseases of the individual, you are disregarding the possible source of serious diseases of the future nation.

I wonder why it is that the Free Trader always says that the indirect benefit claimed by Free Trade is definite, and yet the direct benefit claimed by Protection is indefinite. It seems to me to rather place the Free Trader's argument at a disadvantage than otherwise, for a policy (namely, that of Protection) which is used so widely in the world by people who had to follow us in our commercial start, cannot be so fundamentally wrong in every detail as the Free Traders seem to claim.

In conclusion, I am neither Protectionist nor Free Trader from a national point of view, although I feel sure *our* industry would benefit from Protection, and I think Free Traders should be plainly told that Protection as a policy can be properly argued if they will take off their coats of scepticism and lofty superiority, and get to the practical side of the question in their shirt sleeves.

H. S. H.

Several letters have been received too late for insertion in this issue.

SAVINGS EFFECTED BY THE USE OF AN ELECTRIC DRIVE IN MACHINE SHOPS.

During the past few years the necessity for greater economy in machine shops has made itself felt, and a recent issue of the *Journal* of the American Society of Mechanical Engineers contains a paper on the subject of the economy of the electric drive. It discusses some of the advantages obtained by making use of such a drive in shops in preference to small steam engine unit drives. The author, Mr. A. L. de Lecuw, summarises the present situation. He looks at all sides of the question, although he finally favours electric driving in most cases. It must be borne in mind that although in nearly every recorded example where an electric drive has been substituted for a shaft drive the cost per unit of power has decreased, yet this decrease has in all probability been largely influenced by the introduction of more efficient engines, boilers and subsidiary apparatus. It should also be noticed that the amount of power required to drive the shops has invariably increased, yet this does not prove that the old plant was more efficient than the new, as the output of work has probably increased in greater proportion, this being due, in a large number of cases, to the introduction at the same time of high-speed tool steels, &c.

One of the greatest advantages gained by an electric drive is its capacity for turning out a greater quantity of work from any one particular machine. Especially is this noticeable in the case of heavy machines, where the output is determined in the case of a line drive by the belt speed, and the quantity of material removed depends to a large extent upon the freedom of a casting from swellings and hard patches. With a variable-speed motor drive a large number of gears are dispensed with, and a fine graduation in speed is obtainable, thereby allowing an operator to adjust the speed of his machine to give the most efficient results. An operator is also able to set his tools to the best advantage, as with a motor drive, and its capacity for taking sudden overloads, swellings in castings, irregularities in forgings, &c., may almost be ignored. Belt troubles and the time lost and danger involved in shifting belts are also eliminated. Another point in favour of a motor drive is the fact that it is possible to speed up a machine, giving a proportional increase in its power.

Electric current in a shop permits the use of travelling cranes, and what are now considered as their adjuncts, lifting magnets. These allow of very much easier handling of material; especially is this so in the case of the lifting magnets, which can be used to great advantage for lifting plates, pig-iron and scrap, and for hauling small castings, provided their weight and shape are adaptable to this method of handling. Magnetic separators, clutches and chucks can also be used, the latter especially being of service for quickly and truly setting up work on planers, slotters and the like. Another great boon of electricity in the machine shop is its great advantage for lighting purpose, an advantage which is generally acknowledged and almost universally availed of. By the use of coloured lights signalling can be utilised in this form, which possesses many advantages over the older form of signalling by the use of electric bells.

In weighing the advantages possessed by an electric installation, the following items should be considered:—Engines, boilers, piping, power houses, stacks, &c., will cost considerably less, there will be a complete omission of all transmitting machinery, economy will be effected in steam consumption, in repairs and in the amount of oil, waste, &c., used, while the staff will be reduced; a saving will also be effected in the handling of coal and ashes, while a more even load will in all probability be exerted on the engine, as a number of machines on a single engine tends to equalise the load. On the other hand, there will be a greater first cost for generators, motors and wiring. The fact that copper wire does not suffer depreciation to any extent should be taken into account, as also should the advisability of having a reserve unit, which would not be so necessary for separate steam units, as they would be in duplicate with a plentiful supply of spares.

A point of first importance in the consideration of the economy effected by the use of electricity in the machine shop is the choice of current. Alternating or direct current or a combination of the two may be used, and the control may be central or non-central. As regards the control, this is usually central, but occasions arise

where one part of the establishment is situated at some distance from the main buildings, and it is then a question of calculation as to whether the first cost involved in an expenditure on cables warrants a central control or not. Alternating current possesses advantages over direct current where the current has to be transmitted over long distances, especially in the fact that a wire of smaller cross-section may be used if the electricity is generated at a high voltage. To counterbalance this gain is the cost involved in step-up and step-down transformers. Alternating-current motors possess a large overload capacity and complete freedom from commutator troubles, while direct-current motors allow of a larger air gap, and consequently more wear on the bearing surfaces, as well as the great advantages and possibilities of a variable speed.

In a combination of alternating and direct current, there are great possibilities where cheap power is obtainable. Suitable step-down transformers are provided at a suitable position at the entrance to the shops to transform the voltage to low pressure. A rotary converter transforms the alternating to direct current to be used for driving variable-speed motors and subsidiary apparatus, such as lifting magnets, &c.

Where shops are to be built, the advantage of electricity in the matter of elasticity of shop arrangements becomes apparent. Departments can be built to allow for expansion, and their relative position and size adjusted to the changing needs of the shop, whereas, with a line drive, shops have to be cramped up as much as possible to allow for as much saving in the handling of coal and ashes as is permissible.

It has been remarked that a variable-speed motor drive induces the operator to experiment with his machine to determine the best possible cutting speed for the particular work he is engaged upon. Owing also to the easy means of heating, lighting and ventilating shops by means of electricity, and the comparative freedom from dust, which is much disturbed by belts, the operator tends to produce more work. Fuses and the like help to render the apparatus fool-proof.

In all radical changes in a shop's arrangement it is of the first importance to remember that increase in production is of much greater value than cheapening the cost of unit power. Not only does electricity accomplish the first of these two desiderata, but with a fairly large central control it adapts itself to the second consideration also.

LEGAL.

Goddard and Another *v.* L.C.C.

In the King's Bench Division on Monday and Tuesday, January 31st and February 1st, before Mr. Justice Darling and a special jury, Mrs. Goddard, wife of a jeweller residing at Streatham, brought an action against the London County Council to recover damages for personal injuries sustained in a collision between two electric tramcars belonging to the Council on Brixton Hill on April 16th. The defendants did not deny negligence or liability, and the only question was the amount of the damages. It appeared that Mrs. Goddard was a passenger by car from Streatham to Brixton, and plaintiff alleged that when the car in which she was travelling arrived at the top of Brixton Hill another car dashed into it in the rear with such violence that plaintiff was thrown into the air and she fell back on her seat on her spine. At that moment she noticed the floor of the car open up and the mechanism was disclosed. This so alarmed her that she dashed out on to the platform and sat down. The car, in the meantime, proceeded at a furious pace down Brixton Hill, and when it was some distance down the gradient the car behind again dashed into it, with the result that plaintiff was thrown off with great violence into the roadway, sustaining severe injuries to the head and face. It was stated that before the accident Mrs. Goddard was an active, healthy woman, but now, as the result of her injuries, she would be an invalid for life.

Towards the end of plaintiffs' case counsel announced that the parties had come to terms, and the Court would not be troubled with the hearing any longer.

Surbiton U.D.C. *v.* Callender's Cable & Construction Co., Ltd.

In the Chancery Division on Wednesday, February 2nd, Mr. Justice Warrington, sitting as an additional judge of the King's Bench Division for the trial of non-jury actions, decided a question which arose between the Surbiton Urban District Council and Messrs. Callender's Cable and Construction Co. Mr. Hohler, K.C., M.P., who appeared for the plaintiffs, the Urban District Council, said the question was whether the defendants, the Cable and Construction Co., were entitled in making certain payments to the plaintiffs to deduct income-tax. The amount involved amounted to £135 7s. 9d., and the income-tax was deducted for July, 1907; January, 1908; July, 1908; and January, 1909. Up to the year 1907, the defendants paid the tax, but they now said they were entitled to deduct it for certain purposes. The Urban District Council obtained a provisional order for the construction of a certain electrical power station, and not being desirous themselves to erect it, they entered into a contract with the defendants, whereby the latter were to erect it, and the defendants, subject to certain powers, had the right to work and to receive the whole of the revenue resulting from the working of the power station for a period of time. The Council were to pay to the defendants upon certificates of the engineers, and with the knowledge of the defendants they borrowed the funds necessary for that purpose. The agreement provided that the defendants would repay to the plaintiffs the instalments annually payable, together with the interest. The contractors were to take the whole of the profits, if there were any.

After hearing Mr. Danckwerts, K.C., for the defendants, His Lordship said the question was whether the defendants, who had entered into an obligation to make a certain annual payment to the plaintiffs, were entitled to deduct income-tax from the whole of that annual payment or only from such part of it as was ascertained by reference to certain interest payable by the plaintiffs. He thought the real, in fact, the only question he had to determine, was whether on the true construction of the agreement of May 12th, 1902, the payment which by Clause 16 the defendants covenanted to make was an annual payment arising as a personal debt or obligation by virtue of the contract within Sec. 40 of the Income-Tax Act of 1853. He thought the obligation which the contractors had entered into was to pay a certain annual sum. Was that annual sum an annual payment within the true construction of Sec. 40 of the Act of 1853? If the annual payment was merely the payment of capital extending over so many years, that was not income within the meaning of the Income-Tax Acts, and accordingly that annual payment was not subject to the income-tax. But in the present case he found nothing of the kind. If they considered the agreement, they could find no obligation on the part of the contractors to make the payment referred to in Clause 16. They must look at Clause 16 to find the obligation, and it was simply to pay an annual sum, and it made no difference what the Council were going to pay when they got the money. If the money was income subject to income-tax, it made no difference where they applied that money in discharge of capital charges, even if they might be bound so to apply the money. It seemed to his Lordship, therefore, that on the whole the plaintiffs' action failed, and there must be judgment for the defendants, with costs.

Electric Patents Dispute.

(*Concluded from page* 177.)

At the rising of the Court on Monday, January 31st, his Lordship asked the nature of the second application in the list, and Mr. Bousfield said it was a mere interlocutory application in a petition for revocation. The actual petition for revocation would not come on for some time.

Mr. F. W. T. Bray was the first witness called for the defence, and in answer to Mr. Russell Clarke, he said he was managing director of the Trafalgar Colliery Co. Witness put in a drawing of the hauling plant of the works in their mine. There was a steam engine driving a shaft that carried a large fly-wheel which was connected by rope gearing to a dynamo, and the dynamo was connected by wires, marked on the drawing "armature cable," with a motor, and that motor drove the hauling plant. It was a main and tail haulage for the purpose of bringing trucks of coal up the incline. The excitation of the field of the dynamo was provided by a small dynamo exciting the field both of the dynamo and of the motor. For the purpose of stopping and working to advantage the train loads, by means of altering the resistance in series with the field of the dynamo they were enabled to control the field of the motor.

Cross-examined by Mr. Walter: In their plant they had a water-resistance regulator, and that varied the field of the generator. Their motor was never required to reverse. It always ran in one direction. He did not think there was any resistance in the motor field. It was quite clear that they had separate wires going back from the water resistance down at the bottom of the shaft, because it was necessary that a man should be able to regulate at the bottom.

Re-examined: If it were necessary to reverse the motion of the haulage in the colliery they would do it by introducing a reversing switch.

Mr. H. F. Parshall, examined, said that he was chief designer of the Edison Co. when the Ward-Leonard system of control came into existence. He was for several years the chief engineer of the biggest electrical manufacturing company in the world, viz., the General Electric Co., of America. He had designed the largest electrical plant at present in operation in the world, and he was at the present time engaged on the design of a still larger plant—a machine of 15,000 kw. The greatest difficulty in rolling-mill machinery was in respect of the machines themselves. It was only within the last few years that they could build motors that could stand the strain. Asked what were the requisites of a drive for rolling mills, taking it from the point of view of the load that came on the mills, the Witness stated that there was only one method of control that would suit that class of work at all, and that was the H. Ward-Leonard method. He did not see that a large motor could be controlled in any other way. He agreed with Mr. Swinburne that for the purpose of electrifying rolling mills the Ward-Leonard system forced itself upon them. The other problem that arose on every variable class of work was that of lessening the demand from the source by providing a suitable fly-wheel. That idea had been proposed from time to time—certainly quite 20 years ago. He was in America when Mr. Kapp brought it over in 1893. He was going to use it on a reversible machine, that was to say, a machine that would act either as a motor or as a generator to equalise the load on the tramway feeders. He was consulted in the market, as was also Elihu Thomson and various other experts, and they were rather amused

that Kapp should think there was anything novel in the application of a fly-wheel to a machine whose properties were perfectly well known at that time; the essential use of a fly-wheel would be obvious to any engineer.

Cross-examined by Mr. Walter: There was only one place where an engineer would have put the fly-wheel, and that was on the motor-generator; that was to lessen the demand on the source, exactly as it was put on a steam engine to lessen the demand on the cylinders. There was no invention in combining Ward-Leonard with a fly-wheel. A fly-wheel was an obvious way of getting a greater momentary effort than was provided from the source. He should say it had been obvious for the last 50 years. Continuous-acting rolling machines were known, and those machines could be supplied with a fly-wheel.

Do you think you could put your finger anywhere in the document upon any description of a Ward-Leonard system with other than a constant speed in the primary motor?—Well, constant within general limits, of course.

Cross-examination continued: Ferranti in 1895 gave no instructions how to get a motor which would fall in speed, and he told them nothing about any regulator. He saw no invention in what Ferranti had done. He had had the same thing submitted to him in America two years before, and he rather thought a man must be sanguine to put a fly-wheel on an electric motor.

Mr. Bertram Hopkinson, Professor of Mechanism and Applied Mechanics at Cambridge University, generally corroborated the evidence of the last witness.

Mr. S. Z. de Ferranti, examined by Mr. Bousfield, said he was the inventor of what was described in specification 4,065 of 1895. When he designed that machine the problem he had in view was to improve the electric system of the City and South London Electric Railway. It was with a view to making the lifts electrical and preventing them exercising an injurious effect on the rest of the system that he devised the sort of thing shown in that specification. He thought of the idea purely to meet the difficulty of the existing load put upon the system by an electric lift of that size in relation to the system. In his specification, he said of these machines, "They may also be used for feeding motor or other circuits where the demands are irregular and sudden, and where it is desired not to interfere with the regularity of the primary supply." He was so doubtful about the subject matter in that specification, that he tried to show all sorts of useful combinations with a view to getting something patentable. His primary idea was fly-wheel storage. The machine shown in fig. 1, a motor-generator with a fly-wheel, was most suitable for feeding motor or other circuits where the demands were irregular or sudden. It was exactly what was used at present.

Mr. Bousfield: At Hickman's?—Yes; it shows the right sort of proportions, an immensely heavy wheel in relation to the size of the electric machines.

His Lordship: Where do you say it was actually used?—At Hickman's, the alleged infringement.

Mr. Bousfield: It is the exact thing. If you were going to apply that to a system where the fluctuating demand, for instance, arises from a number of tramcars, that would have to be applied with the rheostatic control?—Yes, it would simply feed the mains supplying the tramcars or trains.

And then take each particular motor, there would have to be a rheostatic control?—Yes, the series-parallel control, the ordinary control that is used on the motors.

If you had been asked any time before 1902 to apply your machine to the case of a single motor driving—let us say a rolling mill—have you any doubt as to what method of control you would have applied?—I think that knowing of the voltage-control system, I should certainly have used that to avoid the trouble of switching in very heavy current circuits.

Cross-examined by Mr. Walter: The first thing set forth in his specification was the reference to preventing variation on a load whose E.M.F. they desired to keep constant. He had heard prior to Ilgner of the practical application in this country of the Ward-Leonard system. There were several printing presses in London worked on the voltage control system—*viz.*, a motor-generator worked in much the same way as was described by Ward-Leonard. The reason for applying it was so as not to take too heavy a demand from the mains of the Supply Co., and so as to be able to run the presses conveniently at different speeds—a heavy reversing machine when run with an electric motor. It was very important to supply it in that sort of way. That was a case in which they had the motor-generator, and they worked by the voltage control.

His Lordship: Any fly-wheel?—No, not that I know of.

Mr. W. M. Mordey, examined by Mr. Bousfield, said that, taking the plaintiffs' specification, if anybody had said, "Take the Ferranti machine and apply it to work a rolling-mill motor by means of controlling the field of the generator instead of interposing resistances," he would say that Ilgner's specification gave very considerably less useful information than could be obtained by the instruction in Ferranti, plus the well-known Ward-Leonard method. Ilgner's specification seemed to him to show that he did not understand either the mechanical or the electrical problem. The only instruction he gave was the indication to use machines that would not work. Ilgner did not seem to appreciate that, as long as the rate of revolution was constant, the fly-wheel could do nothing. Ilgner also did not seem to understand dynamos at all. He spoke of his dynamos being of such a type that any change in the excitation caused a change in the voltage, that, of course, being common to all types. His directions for reversible working were very vague—in fact, his description contained nothing useful, and on several essentials he was wrong. If they did not know Ward-Leonard, they would have considerable difficulty in making a practical application of the specification. The fly-wheel was part of the contents of the tool basket of every designer, and so was the Ward-Leonard system in 1902.

Cross-examined by Mr. Walter: He had recommended Ward-Leonard for railways. It had been used on a railway in Switzerland quite successfully, but not anywhere in the United Kingdom.

Supposing anyone said, "Take Ferranti's machine and work a rolling mill with it, with voltage control." Of course you do not find any such instructions in Ferranti?—I do not find the Ward-Leonard control in Ferranti. Ferranti explained the property of the fly-wheel. He did not describe rheostatic control or any control. In his view it required no invention in 1901 and 1902 to apply the Ward-Leonard system to a purpose analogous to that of rolling-mill work. He defined Ward-Leonard as a form of voltage control.

Mr. Russell Clarke, summing up the case for the defence, said that the principal point in the case was subject matter. Anyone was entitled to employ the Ward-Leonard system for rolling mills, and the question was whether Ilgner had really done anything more than that. Ilgner had limited his claim to rolling mills. That no doubt would prevent him from recovering damages against anyone who used his system for any other purpose, but limiting his claim in that way did not enhance the validity of his patent. The object that the patentee had in view was to overcome the difficulties that the electrician had been under in applying E.M.F. to extremely variable loads. That did not prevent the patent being anticipated by a similar system that was applied to some other machinery. If a man might take out four or five different patents for the same system, connecting each to a particular machine, patent law would become impossible, because it would be almost impossible to show anticipation. The Court had to regard the claim as if it was a patent applicable to any system where the demand for power varied in the same way that it did in rolling mills. He contended that Ferranti might have been applied equally to the problem the plaintiffs' patent proposed to solve. He submitted the plaintiffs' case failed because of want of subject, want of novelty and non-infringement.

Mr. Walter, replying on the whole case, submitted that the evidence brought out this—that Ilgner had disclosed something that had never been disclosed before. He had obtained a slowing-down of the intermediate machine, the speed of the work not being derived by the slowing-down of the fly-wheel as in ordinary cases.

At the conclusion of the arguments, his Lordship reserved judgment. It was arranged that the revocation proceedings should stand over generally.

Bankruptcy Appeal Dismissed.

An appeal was heard last week before Mr. Justice Phillimore and Mr. Justice Bucknill, sitting as a Divisional Court of Bankruptcy, against a receiving order made by the Registrar of the Hereford County Court on December 13th last against Robert Edwin Walker, 16, Widemarth Street and Eign Road, Hereford, electrical engineer and cycle agent.

The debtor executed a deed of assignment for the benefit of his creditors on October 25th, 1909, and with the exception of three firms the whole of the creditors accepted it. The trustee, as the result of a private meeting, accepted an offer of the debtor's interest in the business of Walker & Vickery, and received sufficient to pay a dividend of 12s. 6d. in the £ to all the creditors. A dissenting creditor, however, obtained a receiving order, against which the debtor now appealed. The appeal was dismissed with costs.

Postmaster-General *v.* Great Southern and Western Railway Co.

According to the *Belfast News Letter*, judgment was last week delivered in this case, which had been originally heard by Mr. Justice Dodd, sitting without a jury, and resulted in a pronouncement in favour of the defendants. The learned judge, however, refused to grant the declaration which the Postmaster-General sought for, namely, that under certain agreements entered into between him and the Great Southern and Western Railway Co. in 1883, 1885, and 1906, all apparatus and poles used for the purpose of telephonic communication were telegraphic materials within the meaning of these agreements. On the other hand, the defendants argued that telephone apparatus did not come within the comprehension of these agreements, and the point was emphasised that the existing telephone system would be taken over by the Government in 1911, and that if plaintiff's contention was correct, they as a railway company would lose the considerable revenue which they now received from the Telephone Co. for the carriage of telephonic apparatus, men, and materials. On behalf of the plaintiff reliance was placed on the Edison case decided in the House of Lords, it being held there that the words "telegraph" and "telephone" were synonymous, inasmuch as the means of communication in each case depended on electric current and connecting wires.

Mr. Justice Gibson, in a long and considered judgment, in which he reviewed the various statutory enactments bearing on the case, and the different contracts expressed in the agreements in question, decided that in a collective reading of all these the word "telegraphy" should be construed as comprehending "telephony." Were the defendants' construction to prevail it would involve that all the existing telephones on their system would be regarded as outside the deeds and only permissible in future, and that the use of telephony in connection with telegraphy, where the telegraphist transmitted a written message by the voice, should be stopped. The

plaintiff was entitled to the relief claimed by him, and a declaration would be made accordingly. Mr. Justice Madden and Mr. Justice Kenny concurred.

The Court ordered that each side should abide their own costs.

Babcock & Wilcox *v.* Spearing.

In the King's Bench Division on Monday, January 11th, Mr. Justice Darling and a special jury commenced the hearing of an action brought by Messrs. Babcock & Wilcox, Ltd., against Mr. Arthur Horace Spearing. Plaintiffs sued the defendant in respect of an alleged breach of contract dated May 16th, 1903, and made between the plaintiffs and Mr. Spearing and others, and further they asked for an injunction to restrain defendant from continuing to commit such alleged breaches of contract.

Plaintiffs alleged that the defendant, who was for some time in their employ, had manufactured water-tube boilers in competition with them and in breach of an agreement arrived at in settlement of proceedings in Chancery. Two actions were commenced in the Chancery Division against defendant and others, in which it was alleged that they had infringed plaintiffs' patent rights. Under the agreement in settlement defendant undertook not to manufacture or sell water-tube boilers according to a certain patent, and to assign such patent to the plaintiffs. Defendant also, it was alleged, agreed "not to undertake the sale or manufacture of any water-tube boilers in competition with the plaintiffs hereafter." Defendant agreed to transfer to the company all orders received for such boilers, plaintiffs agreeing to pay £2,000 in consideration of such transference. Plaintiffs contended that if defendant did not break the agreement by manufacturing the boilers himself, he tendered for the supply of one, and they cited as an instance a tender to the Electrical Committee of Ashton-under-Lyne, alleging that defendant arranged with a firm in the Midlands for the actual manufacture of the boiler. It was admitted by plaintiffs that under the agreement, defendant was only bound not to sell water-tube boilers for a certain period, and that period had since expired. The question was whether or not they could show that defendant had been undertaking the manufacture of water-tube boilers in competition with plaintiffs, and Mr. Simon, K.C., for the latter, argued that defendant had done so.

Mr. Powell, K.C., for defendant, urged that his client did not undertake the manufacture of the goods; they were made by another firm and sold to defendant.

The point arose as to whether defendant agreed not to "undertake the manufacture of" or "to manufacture" the boilers.

Having heard arguments of counsel and evidence, on Monday last, the jury returned a verdict for the plaintiffs, and his Lordship held that they were entitled to the injunction asked for, together with an inquiry as to damages.

On the application of defendant's counsel, leave to appeal was given, and the injunction was suspended for a fortnight, an account to be kept meanwhile.

M'Laren *v.* W. S. Cruickshank & Son.

Lord Cullen, in the Court of Session at Edinburgh, disposed of an action by George M'Laren, plumber and electrician, carrying on business under the name of David Stevens, at 15, Howe Street, Edinburgh, against W. S. Cruickshank & Son, building contractors, Lower Gilmore Place, Edinburgh, for £1,021 16s. 6d., the balance of an account for the electric lighting and other electrical work at the King's Theatre, Edinburgh. Defenders were contractors for the construction of the theatre, and sub-contracted with pursuer for the plumber work for the buildings. No question arose in regard to that sub-contract. Pursuer also executed the electrical work of the theatre, and an arbiter decided that the amount due under this head was £3,021 16s. 6d. Of that sum £2,000 was paid to account, leaving the balance now sued for. Pursuer averred that the sub-contract for the electrical work was entered into with the defenders. This the defenders denied, and stated that pursuer's contract was with the Edinburgh Construction Co., Ltd., on whose instruction the defenders paid the £2,000 to account. According to the *Edinburgh Evening News*, his Lordship decerned against the defenders with expenses.

BUSINESS NOTES.

Company Registrations in 1909.—The *Investors' Guardian*, in its review of 1909, says that the Somerset House record of company registrations in 1909 confirms the evidence of various other indices of greater activity in company enterprise.

A larger number of companies were registered in England and Scotland in 1909 than in any previous year in the history of joint stock companies. This is the outstanding feature of the year.

The registrations in the second half of the year were not only the largest on record for any half-year, but they represented a larger capitalisation than in any corresponding half-year since the boom of the late Nineties. Usually the first half of the year is the period of greater activity in company registration, but it was otherwise in 1909. The second half yielded 108 more companies and £8,999,180 more in capitalisation than the first half.

It is evident that two different forces are in play. The number of registrations is chiefly influenced by the greater use of the joint stock system for small private businesses and for semi-private speculations; the capital importance of the registrations is largely influenced by the state of the money market, and the disposition or otherwise of the public to more or less speculative enterprise in concerns and industries involving large capital.

A speculative movement on a large scale has been notably lacking for the last 10 years, but there is the prospect of a distinct revival.

Our contemporary gives tabulated figures, from which we extract the following:—

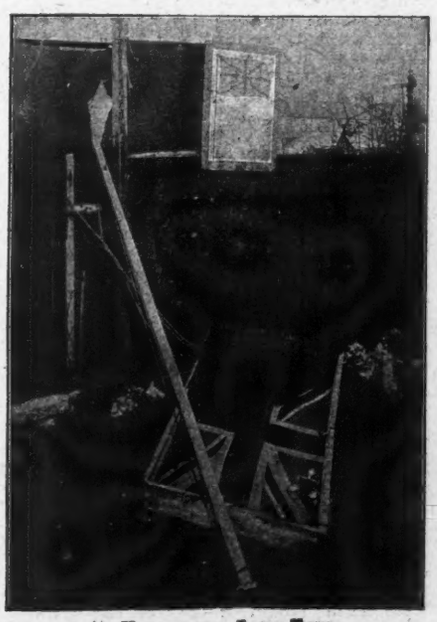
English registrations.	1907.	1908.	1909.
Number of companies ...	4,809	4,639	5,834
Electric	£2,200,635	£1,791,025	£3,250,920
Engineering and hardware ...	7,939,230	6,222,195	9,638,343
Gas	1,236,840	1,010,600	919,500
Mining and exploration ...	18,727,610	14,967,992	23,106,313
Railways and tramways ...	1,788,547	1,827,050	2,931,740
Rubber	4,927,950	4,151,481	13,736,014

Shipping shows a distinct improvement, and there is also a revival to be noticed in the engineering section. Both these industries have been through severe depression, and it is satisfactory to find the company returns confirming the prospect of greater activity. It is not surprising to find a big drop in registrations affecting the textile industries. Lancashire has had a very bad year, and there has been little scope for the employment of new capital. Yorkshire, on the other hand, has been busy.

Condensing Plant Contracts.—Amongst the orders recently secured by The Mirrlees Watson Co., Ltd., of Glasgow, are the following for independent steam condensing plant:—

Mr. P. J. Mitchell, London, for Maltby Main Colliery; the British Thomson-Houston Co., Ltd, for Weardale Steel Co., for Dalton Main Colliery Co., Silverwood Collieries, for the Rangoon Station (fifth installation), and for Carrongrove Paper Works (repeat order); Messrs. Walter Scott, Ltd., Leeds Steel Works; the Clifton and Kersley Coal Co., Ltd., for Outwood Colliery; Las Palmas de Chaco Austrel Sociedad Anonima; De Beers Consolidated Mines, Ltd, for Dutoitspan Mine; Messrs. J. Brown & Co., Ltd., Sheffield; Messrs. Knight, Schoolbred & Co., Buenos Ayres, for Patagonia; Messrs. Achd. Russell, Ltd., for Polmaise Colliery, Stirling; Messrs. Jas. Howden & Co., for Govan Corporation, and for Scott & Sons, Dundee.

A Novel Lamp Test.—We do not often receive pictures such as that given herewith, and for the interest of readers who may be wondering what it is all about, we may say at once that it is intended to illustrate how great is the ability of tantalum lamps to withstand rough treatment. It came about in this wise. A patriotic resident of Seven Kings showed his interest in Imperial affairs during the recent General Election by rigging up an



An Unexpected Lamp Test.

impromptu Union Jack sign, supported on a high mast. The sign, which contained a couple of tantalums, was illuminated nightly, and as it faced the railway, it attracted a good deal of attention. After a stormy night—we refer to the elements, not to political hooliganism—the mast was found to be broken completely in two. In spite of the fact that the sign fell with great force, the lamps were still burning when found. The consumer in question, in a letter to Siemens Bros. Dynamo Works, Ltd., rightly describes it as "a remarkable test of the durability of your tantalum lamps." Gas journals, please copy, giving pictures of the incandescent mantle that would stand a like strain.

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South Africa.—The *British South African Export Gazette* learns that orders for a quantity of electrical plant may be anticipated in the near future from the Pigg's Peak Development Co., Ltd. Orders will shortly be given out for electric generators, cables, &c., by the Wankie (Rhodesia) Coal, Railway and Exploration Co., Ltd. An order for a 3,000-KW. steam turbo-alternator, including condensing plant, exhaust pipes, switchgear and cable connections, has been placed in England for the Johannesburg Municipality. The same Municipality is about to give out contracts for the supply of 12,800 yd. of cable. A 60-ton electric crane is on order with Messrs. Nagel & Kaemp, Hamburg, for installation at the Lourenço Marques wharves.

Electric Fittings for the Far East.—The BIRMINGHAM GUILD OF HANDICRAFT, LTD., of Birmingham, is shipping during the present week, to the order of the Crown Agents for the Colonies, a considerable consignment of special art electric light fittings for the new Law Courts at Hong Hong, for which Sir Aston Webb is architect.

Annual Dinners.—The first annual dinner of MESSRS. ECKSTEIN, HEAP & Co. was held at the Grand Hotel, Manchester, on Saturday, 5th inst. Mr. A. Eckstein presided, and there were upwards of 120 members of the staff and employés present. The customary loyal toast having been honoured, Mr. Heap (who holds a commission in the Territorials), in replying to the toast of "His Majesty's Forces," dwelt at some length on the benefits to be derived from membership of the forces, both from a physical and Imperial standpoint, and gave encouragement to those of the staff who contemplated membership. Mr. Eckstein then proposed the "Staff and Employés," and to this toast Mr. Hall and Mr. Mellis, on behalf of the staff, made suitable replies. The toast of "The Firm" was proposed by Mr. F. Panter, who gave a brief *résumé* of the progress made by the firm during the four years of its existence. The remainder of the evening was given up to an excellent musical programme, arranged entirely by members of the staff and employés.

The annual dinner of the Musselburgh and District Electric Light and Tramway Co., Ltd., was held last week, Mr. A. A. Watkins, manager, presiding.

Bankruptcy Proceedings.—A. E. FELGATE and W. STOREY (Felgate & Storey, electrical engineers, Reading and Caversham.)—Receiving order made at Reading, February 5th, on debtors' petition.

W. T. HARRIS, electrical engineer, Commercial Road, Portsmouth.—First and final dividend 2s. 3½d., payable February 10th, by Whittaker & Bailey, 3, Portland Street, Southampton.

PETER SMITH, electrician, 18, Mill Street, late 9, Legh Street, Warrington, Lancs.—This debtor attended at the Court House, Palmyra Square, Warrington, last week, for his public examination. It transpired that he commenced business in 1906 with a capital of £50 cash, which represented his savings. The business was not a success, and last year he took a situation, but had not been regularly employed. He ascribed his position to competition, lack of capital, sickness of self and family, bad debts and bad trade. Bad debts amounted to £60 5s. He had borrowed £5 from a money-lender, and had agreed to repay £7 10s. by weekly instalments of 3s. 6d. There were net assets £16 9s. 5d., against liabilities £210. The examination was concluded.

JOSEPH PLATT and RICHARD BLEASDALE (trading as Platt and Bleasdale), electrical engineers, Victoria Square, Bolton, Lancashire.—The liabilities herein are put at £1,439, to meet which there are assets of £1,390. The following are creditors:—

Adams & Co.	£19	Gratix, S., jun., & Bros., Ltd.	£59
Brotherton Tubes & Conduits, Ltd.	77	Gabriel, F., & Angenault	19
Crompton & Co., Ltd.	324	Henley's Teleg. Works Co.	204
Dorman & Smith	73	Muller, A. C.	15
Electrical Co., Ltd.	34	"Bankers"	107
Eckstein Heap & Co.	24	Sunbeam Lamp Co.	29
Fairbrother, H.	15	Tucker, J. H., & Co.	31
General Electric Co.	302	Walmsley & Fisher	16
		Andrew, L., & Co.	13

Rubber Tape Prices Advanced.—We are informed by MESSRS. SIEMENS BROS. & Co., LTD., Caxton House, Westminster, S.W., that the prices of the rubber tapes contained in their lists Nos. 510 and 510A, have been increased by a further 10 per cent., making a total increase of 20 per cent. since these lists came into operation.

Catalogues and Lists.—MR. FRED. J. DOWN, 6, 7 and 8, Crutched Friars, London, E.C.—A batch of literature relating to various manufactures. Among these is "Gear Shield," a graphite gear lubricant which is being used by a large number of electric tramway and railway systems, collieries, rolling mills, &c.; portable hack saws for cutting rails, &c.; the "Prache" system of anti-vibratory foundations; guy-anchors; electric jointing materials.

MR. S. THOS. PEMBERTON, 109, Colmore Row, Birmingham.—Neat desk calendar with monthly cards.

LONDON UNDERGROUND RAILWAYS.—A calendar card with map of the electric railways; on the reverse the times of first and last trains on these railways—a very handy and useful reference table.

THE BRITISH VACUUM CLEANER CO., LTD., Parson's Green Lane, London, S.W.—A 20-page pamphlet just issued, particularising and giving a number of interesting pictures of their Booth's patent electrically-driven vacuum cleaners.

THE BENJAMIN ELECTRIC, LTD., 1A, Rosebery Avenue, London, E.C.—New export catalogue (No. LI), containing 16 pages of illustrations and prices of the Benjamin wireless clusters and lighting specialities. Any inquirer abroad can obtain a copy on request.

MESSRS. MATHER & PLATT, LTD., Queen Anne's Chambers, London, S.W.—The "Sprinkler Bulletin," explaining the undoubted advantages of the Grinnell sprinkler system, which has put out, or held in check, many a fire which would otherwise have had disastrous results. The general engineering supplement describes the Mather & Platt system of train lighting, with their special self-regulating dynamo, which has the remarkable property of giving a current constant both in strength and in direction (without shifting the brushes or changing any connections), no matter which way or how fast the train is running.

MESSRS. COX-WALKERS, LTD., North-Eastern Electric Works, Darlington.—Leaflets showing and pricing their 1910 electric bell and their patent "Acetylyter" for fitting to motor-car lamps.

THE SILICO-BITUMEN CO., LTD., 13, Walbrook, London, E.C.—Sixteen-page booklet describing their Silico-Bitumen insulating compounds—their nature and properties, with special notes on testing them. The base product is pure, soluble bituminous matter.

THE WORTHINGTON PUMP CO., LTD., 153, Queen Victoria Street, E.C.—New catalogue describing the Worthington "Arrow" patent water-meter, in which a wheel with spiral vanes placed in the conduit provides the motive force for driving the registering mechanism. The meter is made in sizes from 2-in. to 48-in. bore, and works under any pressure.

Dissolutions and Liquidations.—PANTELEGRAPHY PUBLISHING CO., LTD.—A meeting is to be held on March 5th at 13, Old Jewry Chambers, E.C., to hear an account of the winding-up from the liquidator, Mr. J. B. Wandless.

WILLIS & Co., electrical and mechanical engineers, 2, Commercial Street, Knott Mill, Manchester.—Messrs. U. Horsfall, J. Crowther & E. O. Coulthard have dissolved partnership.

HORSFALL & LINFORD, electrical and mechanical engineers, 2, Commercial Street, Knott Mill, Manchester.—Messrs. U. Horsfall and J. Linford have dissolved partnership. Mr. Horsfall attends to debts.

PHOSPHOR BRONZE CO., LTD., Sumner Street, Southwark.—First meetings of creditors and contributories are called for February 15th at Carey Street.

River Plate Notes.—The *Review of the River Plate* says that the Municipality of General Sarmiento will shortly call for tenders for the erection of an electric light station. The tender of Messrs. Colson, Brookhouse & Pyne, for the electrification of the Santa Fé Municipal Tramways, has been accepted. The concession is for 60 years. The Santa Fé Municipality has accepted the tender of Messrs. Geiger, Zublin & Co. for the supply of machinery for the electric light station, at a cost of $80,000 gold.

Trade Announcements.—MR. FREDERICK R. HILL, late of the Foreign Department of the Brush Electrical Engineering Co., Ltd., 9, Gracechurch Street, E.C., has been appointed sole agent for the South of England for Hailwood's patent hot air, smoke-consuming furnace bridges for steam boilers and special adhesive furnace cements. Particulars can be obtained on application.

The agency of MESSRS. MEIROWSKY & Co., electrical insulation manufacturers, Cologne-Ehrenfeld and Urbach O/R, hitherto carried on by Messrs. Geo. Schultz & Co. at 10, Bush Lane, London, E.C., has been transferred to Excelsior Works, Ravald Street, Salford, and is under the direction of Mr. D. H. Schultz. These works have been opened by Messrs. Meirowsky & Co. for the purpose of manufacturing their patented Pertinax and compressed mica tubes and other productions. A considerable stock of their mica plate and excelsior materials is kept. The removal of this branch of Messrs. Schultz's has been effected for convenience of manufacture, their other departments being carried on from the London address, as before.

MESSRS. SIMPLEX CONDUITS, LTD., notify that they have registered the telegraphic address "Sicondulim" for their office at 116, Charing Cross Road, London, W.C., and all telegrams intended for the attention of Mr. Waterhouse, Purchasing Department and Publicity Department, should be so addressed.

MESSRS. CECIL E. LUGARD & Co., of Middlesbrough, have removed to St. John's House, Chester.

MESSRS. W. GERHARDI, of Lüdenscheid, Germany, have secured from some prominent English and Continental copper wire manufacturing companies large orders for continuous rod and wire-drawing machinery to draw the rolled copper rod down to No. 17 S.W.G. in one operation without annealing. The firm has had a practical experience extending over 65 years in designing and building special machinery of every description for copper and brass sheet, rod, wire and tube mills and cable works.

MESSRS. JULIUS SAX & Co., LTD, have, owing to expanding business, removed to larger premises at 24A, High Street, W.C.

MESSRS. EVERETT, EDGCUMBE & Co., LTD., have removed from 87, Victoria Street, S.W., to larger premises at 117, Victoria Street, S.W., to cope with increasing business.

Fire.—The power house connected with the Victoria Works of MESSRS. BAYLISS, JONES & BAYLISS, LTD., fence and hurdle makers, Wolverhampton, was completely destroyed by fire between Saturday night and Sunday morning, resulting in damage to the extent of between £35,000 and £40,000. The power station was an isolated building, some 80 yards long, 12 yards wide, and 30 or 40 ft. high. Its electrical machinery equipment included seven generators, made by the Electric Construction Co., Bruce Peebles, and Vickers, Son & Maxim, Ltd., driven by seven gas engines, and two large converters dealing with the supply of electricity from the Wolverhampton Corporation mains.

LIGHTING and POWER NOTES.

Argentina.—The directors of the River Plate Electricity Co. have purchased land at La Plata on which to erect a new river-side generating station to supply three-phase current at 6,000 volts. This will be supplied to the city through underground cables, and transformed to direct current for the central portion, and to a three-phase L.T. supply for the outskirts. The first plant will consist of three Babcock marine type boilers fitted with induced draught, and two 2,000-KW. turbine plants with condensers. Tenders are now being called for plant, and the work is expected to be finished by April, 1911.—*Review of the River Plate.*

Australia.—There has been a marked expansion in the electric light and power works in New South Wales during the past decade. From 33 works in 1899 there are now 97, while the number of employés has grown five-fold, and the value of the plant to an even greater extent, as the following table shows:—

Year.	Works. No.	Persons employed. No.	Power and machinery. Plant (full capacity.) H.P.	Value. £
1899	33	147	2,779	129,027
1900	33	191	3,961	110,051
1901	53	340	12,447	282,842
1902	58	413	21,175	469,985
1903	73	434	21,994	528,587
1904	65	464	24,492	624,686
1905	67	521	31,862	778,313
1906	66	565	38,337	975,723
1907	91	634	43,215	1,109,535
1908	97	748	46,200	1,112,231

The report of the electricity department of the Broken Hill (N.S.W.) Council, reveals an extraordinary state of affairs, which on account of its rarity is worth noting. It appears, according to the *Australian Mining Standard*, that in 1906 the cost of production per unit was 5·5d., and the sales realised 7·75d. per unit, leaving a profit of 2¼d. per unit sold. By 1908 the cost of production had increased to 7·6d. per unit, and the price realised was 7·9d. per unit—a profit of only ·3d. per unit. During the first half of 1909, however, the profit totally vanished, as, notwithstanding the fact that the cost of production had increased to 8·5d. per unit, the revenue had fallen to 7·6d. per unit, so that every unit used showed a dead loss to the Council of ·9d. The working cost in 1907 amounted to 43 per cent. of the revenue; in 1908 it was 92 per cent., whilst this year it has been no less than 110 per cent.

Bacup.—The T.C. has applied to the L.G.B. for a loan of £3,000 for electricity purposes, £1,800 being for mains, &c., for immediate use, and £1,200 for prospective expenditure for five years.

Bath.—The Great Western Railway Co. is putting in an installation for electric lighting at the Westmoreland goods yard at Bath.

Bishop Stortford.—The Ratepayers' Association has passed a resolution urging the U.D.C. to take steps to provide the town with the electric light independent of private action.

Bognor.—The U.D.C. on Friday last received from the Chichester E.L. Co. an intimation that it intended applying for a prov. order for electricity supply. The matter was referred to the Lighting Committee.

Bootle.—It was reported at the Corporation meeting on Thursday, February 3rd, that the electricity undertaking had been so successful during the year that it had been possible to hand over to the relief of the rates a sum equal to a 1d. in the £. In view of this satisfactory state of things, and taking into consideration the additional responsibility about to devolve upon him in connection with the proposed alteration and additions to the machinery at the power station, it was decided to grant the borough electrical engineer (Mr. T. D. Clothier) an honorarium of £50.

Bridlington.—The T.C. decided on Monday evening to purchase new electrical machinery, at a cost of £2,699. The expenditure has been rendered necessary by an increase of 250 per cent. during the past five years in the demand for electricity.

Brazil.—The Igarapara Municipality has signed a contract with the Cia. Paulista de Electricidade for the installation of an electric light and power plant for the city, at a cost of 160 contos. The power will be derived from the Bandeira Fall, 18 km. distant from the town.—*Brazilian Record.*

Continental Notes.—DENMARK.—The Government is arranging to place submarine cables under the Sund, which separates Helsingborg, Sweden, and Helsingor, Denmark, by about three miles, for the purpose of transmitting energy from a 325-ft. waterfall situated about 1¼ miles from the mouth of the Lagu, in Sweden.

SWEDEN.—As a result of the rapid development of the Stockholm Electrical Works, the management proposes to dismantle the original steam central station in the Reguteringsgatan, which has become too old-fashioned for economical working, and to replace the steam plant with accumulators for the storage of energy from the main central station.

Dundee.—Owing to the increased demands which are being made on the electricity department for energy since the inauguration of the new high-tension system, it has been necessary to install at the Lochee sub-station another rotary converter set of a 250-KW. capacity. This set, which is being supplied by the British Westinghouse Co., has now arrived, together with switchgear supplied by the B.T.-H. Co., and will forthwith be put into commission.

Dysart (Fife).—A proposal by a colliery company to light the harbour by electricity at a cost of £26 per annum, as against the present cost of £25 for gas, is being considered by the Harbour Committee of the T.C.

Eastbourne.—The electrical engineer reports that he finds that the cooling plant will have to be enlarged at an approximate cost of £250. He submitted to the Committee at a recent meeting a curve showing the maximum load and output on the day of the greatest demand for last year, as compared with the nine years previous, the peak load for last year showing an increase of 1·4 per cent., and the units generated a decrease of 3½ per cent.

Edinburgh.—The annual report of the Electric Lighting Committee of the T.C. states that owing to the introduction of the metal-filament lamp the increase in the maximum load and in the units sold has been smaller than the average for the preceding years, but it is hoped that the efficiency and moderate cost of the new lamp will make the use of electric light more general. The units sold during the year were as follows:—Lighting, 9,833,301; power, 3,589,527; public street lighting, 1,832,637, this being an increase of 185,918 units, or 2 per cent. for lighting; an increase of 69,678 units, or 2 per cent. for power; and an increase of 52,861 units, or 3 per cent. for street lighting. The motors added during the year amounted to 601 H.P., as against 547 H.P. for the year before, making a total of 9,397 H.P. connected.

Gillingham.—As a result of the adoption of recent recommendations involving the installation of Diesel plant at the generating station, various alterations in the staff have been under discussion by the Electricity Committee and the T.C., and to cut a very long discussion short, it has been agreed that for the next three years that the electrical engineer shall receive £300 per annum plus 1 per cent. of the gross profits, this arising from a proposal of the Mayor that the engineer's salary should be reduced from £350 to £300 per annum.

Grays.—A L.G.B. inquiry was held on February 2nd into the application of the U.D.C. for a loan of £900 for electricity purposes. There was no opposition.

Hanley.—At a recent meeting of the T.C., Alderman Coates pointed out that they would have to extend the generating plant in the autumn, and that the engineer had been instructed to get out the necessary plans, &c., so that the new Council should be prepared in the matter.

Isle of Wight.—The joint Hospital Board has decided to have the new hospital being built near Newport wired for electric lighting.

Littlehampton (Sussex).—The Chichester E.L. and Power Co. has informed the U.D.C. that it intends applying for a prov. order for electric supply, for which purpose a local company will be formed.

London.—The Brompton and Kensington Co. has introduced an alternative contract system of charging, and where electric light is used exclusively, is prepared to quote a fixed annual charge, with 2d. per unit for energy up to the quantity which at that rate equals the amount of the fixed charge, and 1d. per unit for all beyond, the energy being used for lighting, heating, or cooking purposes. The flat rate for heating will be raised to 2d. per unit.

Macclesfield.—The T.C. on February 2nd decided, by 25 votes to 12, "That in view of the large expenditure to which Macclesfield was already committed and no demand for the supply of electricity in the borough having been made, the Council decline to exercise its powers of installing a system of electrical supply, but offer every facility for a company to come in and provide such a supply, the Corporation safeguarding the interests of the ratepayers in the usual way." The Gas Committee had recommended the Council to retain the order.

Manchuria.—The American Vice-Consul of Mukden, reports that through the initiative of that Consulate, an American company is arranging with the Chinese authorities to install an electric light plant at Chang-hun (Kuanchengtzu), the junction city of the Japanese and Russian railway lines. The initial cost of the plant will be approximately 125,000 taels (about $90,000). Most of the material for this installation will be of American manufacture and the installation of the plant will be under the supervision of an American engineer.—*Electrical World.*

Newcastle-under-Lyme.—The T.C. has applied to the L.G.B. for a loan of £300 for mains extensions in Liverpool Road.

Newport.—Mr. C. P. Sparks, who was recently consulted by the T.C. regarding the electrical undertaking, recommends the abolition of discounts allowed to users of electric light, which amount to about £1,000 a year. Another recommendation is the discontinuance of the arrangement under which coal is carried by a local firm to the power station in Corporation Road, and which costs about £250 per annum, the idea being that the Council should make provision for doing the work. It is further recommended that a check system should be adopted for checking weights and tolls, and that Llanarth Street power station should be used as little as possible for generating electricity.

Normanton.—The U.D.C. on February 1st discussed the E.L. question, which arose upon a communication from the Yorkshire Electric Power Co., which asked, as the mains were about to be extended to the Castleford and Whitwood districts, if there was a possibility of the Council shortly applying for a prov. order for E.L. The Council decided to ascertain upon what terms a report upon the installation of the E.L. in the district can be obtained from certain electrical engineers.

Reading.—The T.C. at its meeting last week, unanimously resolved to oppose the Bill to be promoted in the ensuing session of Parliament by the Reading Electric Supply Co., Ltd., "to extend the area of supply, and to confer further powers upon the company in relation to their undertaking, and for other purposes."

Rochdale.—The T.C. has decided that, in future, electricity supplied to motors used directly or indirectly for lighting purposes shall be charged for at lighting rates.

Runcorn.—The Castner-Kellner Co., Ltd., has again approached the R.D.C. with reference to the E.L. question. The company is seeking a prov. order, and again asks for the Council's consent. The Council has decided to confer with representatives of the company, and also with officials of the Salt Union, which is also applying for an order.

Stretford.—At the last meeting of the Lighting Committee, the chairman and the resident electrical engineer directed attention to the approaching necessity for a scheme of extension of plant at the generating station to deal with the next winter's load. Consideration of the matter was postponed until the next meeting.

Tavistock.—A proposal that Messrs. Drake & Gorham should submit a scheme for electric lighting in the town, was recently negatived by the Council.

Thurstonland (Yorks).—The U.D.C. has decided to ascertain the cost of an electric light installation for the town.

Tonbridge.—The U.D.C. has directed specifications to be prepared for a new boiler and economiser for the electricity works at an estimated cost of £900.

Torquay.—The engineer has been instructed to consider the question of installing a 1,000-C.P. metallic-filament lamp on one of the arc lamp standards as an experiment, and, if practicable, to fix such; also to report with regard to replacing the present double arm standard with some other means for more effectual lighting.

Transvaal.—According to the *African World*, the new Rosherville electric power station in the Transvaal will be very similar to the Brakpan station, except that the units will be 12,000 KVA. instead of 3,000 KW. It will also include four 4,000-H.P. steam turbo-compressor sets.

U.S.A.—The maximum load of the Commonwealth Edison Co., Chicago, which occurred on December 6th, 1909, was 158,090 KW., being a record load, showing an increase of 34 per cent. over the previous year's figure.—*Electrical World.*

TRAMWAY and RAILWAY NOTES.

Bacup.—The Corporation intends to construct forthwith a tramway from Bacup to Shawforth at a cost of £25,000. This line will link up the systems, so that it will be possible to run cars from Blackburn to Manchester. Bacup will also be brought into direct communication with Rochdale.

Birmingham.—Fresh trouble is apparently in store for the Birmingham authorities on the side of the city which has lately been enlarged by the absorption of Quinton. The Halesowen Light Railway Co. is renewing an attempt to construct a light railway from Beech Lanes, near its junction with Balden Road, to the King's Head, and thence along Bearwood Road to the existing tramway of the Birmingham and Midland Tramway. The Light Railway Commissioners have already granted authority for the construction of the line, and the time for carrying out the project has been extended on two occasions. By an order confirmed last year it must be substantially commenced by August, 1911, and finished a year later. The Birmingham authorities, however, are strongly opposed to the proposal. At a meeting held last week the City Council authorised the necessary steps to be taken to oppose the application of the company and to seek powers to construct a tramway along Beech Lanes between the King's Head and Balden Road. The application to Parliament, however, is not to be made until the demand for the tramway will, in the Corporation's opinion, justify the application.

Black Country.—The boycott at West Bromwich and in other parts of the Black Country, of the B.E.T. tramways, over the "fair fare" system continues, and is gaining additional adherents from day to day. Though West Bromwich seems to be the moving centre, there are evidences that at Darlaston, Wednesbury, Dudley, Brierley Hill, and in other districts the "fair fares" are being strongly resented. The matter was discussed at the Kidderminster Chamber of Commerce last week, when it was stated the system had aroused the greatest indignation on all hands. It was decided to call the attention of the Council to the great dissatisfaction prevailing, in the hope that the Council would make representations to the tramway company. The question was discussed at a meeting of West Bromwich tradesmen held last week, when it was decided to send a deputation to interview the company on the matter.

Canada.—It is stated that the London and Port Stanley Railway will shortly be converted to electrical working, with a view to holding the competitive traffic between St. Thomas and Port Stanley.

Cardiff.—The full report by Mr. Arthur Ellis on six months' working of the tramways under the revised fares, shows that matters have improved to a greater extent than was indicated in our note last week. Thus during the six months ending December 31st, although the number of ordinary tickets shows a decrease of 163,539, or 79 per cent., the number of transfer tickets increased by 256,255, and as these latter tickets cover two distinct journeys (which would otherwise each require two single tickets) Mr. Ellis considers that it is fair to conclude that many more passengers have been carried. Taking only the tickets issued, however, there has been an increase of 92,716 passengers, and the receipts have increased by £2,060 12s. It is pointed out that in obtaining this result, while some fares have been increased, others have been reduced, the lengths of stages having been adjusted. Mr. Ellis considers that the receipts are improving at the rate of over £5,000 per annum.

Continental Notes.— BELGIUM.— The municipal authorities of Schaerbeck, near Brussels, have just granted a concession for the establishment and working of a system of railless electric vehicles in the town.

AUSTRIA.—The electrification of the Vienna Metropolitan Railway is to be taken in hand by Messrs. Siemens-Schuckert, with the financial assistance of the Austrian Länderbank.

Croydon.—The Tramways Committee of the B.C. on Monday, reported an increase of 246,241 passengers, and £1,418 in takings for the four weeks ended January 14th, as compared with the corresponding weeks of 1908-9. It has been agreed to increase the salary of Mr. Harris, engineer (appointed in June, 1906), from £208 to £240 per annum; and that of Mr. Foster, traffic superintendent, from £182 to £208.

Doncaster-Bentley.—The Light Railway Commissioners on February 3rd, held an inquiry into the application of the Doncaster T.C. for an order to extend the tramways to Bentley, where a new colliery has been established. The extension, with the provision of cars, will cost about £7,600.

Glasgow.—A system of ventilating cars has been submitted to the Tramway Committee, which has agreed to fit up one of the cars with a view to having it tested.

The large new offices which were recently erected for the Tramways Department have been found inadequate, and extra premises have been taken.

Two new routes on the Glasgow system are in course of construction, viz., an auxiliary line to give more direct communication to Shettleston *via* Dennistoun, and a new line from the foot of Craw Road to the top of Clarence Drive. The lines are over half a mile in length, and will be ready for traffic in about a fortnight.

Halesowen.—At a meeting of the U.D.C. last week the clerk reported that the Light Railway Commissioners had decided to hold an inquiry into the application to be made by the Halesowen Light Railways Co. for tramway extensions within the city of Birmingham and the districts of Oldbury and Rowley. It was decided that the Council should support the promoters at the forthcoming inquiry.

Isle of Wight.—The various proposals regarding electric traction in the Isle of Wight have advanced one step further. The railway companies have announced that they are unable to carry out any electrification themselves owing to the lack of funds, but are willing to consider any financial proposals by the County Council. The matter is now being referred to the C.C., and the question of whether to convert the existing railways or to adopt a system of tramways has to be settled. Mr. H. Upton Marshall, M.I.E.E., is putting the alternative proposals forward.

Liverpool.—The accounts of the electric tramways undertaking submitted at the meeting of the Corporation on Wednesday, February 2nd, show a credit balance on the revenue account of £180,251, increased by interest to £189,413. Against this amount are the following items of expenditure:—To interest, £50,919; rent of leased lines, £5,891; sinking fund contributions, £56,177; repayment of loans, £3,071; contribution in aid of general rate, £27,451; and reserve, renewal, and depreciation account, £54,902.

Newcastle-on-Tyne.—At a meeting of the City Council on 2nd inst., Mr. Rodgers, chairman of the Tramways Committee, stated that, up to the previous week, the returns had shown a considerable increase on the month, but through the recent snowstorm they had sacrificed £400. They had 10 snow ploughs out, and it was due to the Tramways Committee that the lines were kept open.

Oldham.—An important conference took place on Saturday, 5th inst., between the representatives of the Oldham, Ashton and Hyde Tramway and delegates of the Ashton and Hyde Trades and Labour Council with regard to what is called the "fair fare system," introduced by the company on New Year's Day. The new arrangement has caused dissatisfaction among the working classes of the district, and the trade delegates submitted alternative proposals. The chairman of the company attended the conference and promised to lay the proposals before his directorate and to communicate the result to the Trades Council.

Plymouth.—The Electricity and Street Lighting Committee held a special meeting on Monday, at the request of the Tramways Committee, further to consider its previous decision in reference to the charges for the supply of electricity for tramway purposes after April 1st next, viz., 1¾d. per unit up to 75,000 units per annum, and 1½d. per unit for all energy supplied in excess of that quantity. The present charge to the Tramways Committee is 1¾d. per unit throughout, and the annual consumption amounts to about 120,000 units. The Committee came to the conclusion that it could not alter its previous recommendation.

Tynemouth.—The Parliamentary Committee of the T.C. has decided not to oppose the North and South Shields Electric Railway Bill.

U.S.A.—According to an American contemporary, the Lincoln Traction Co. recently ordered a 500-KW. 60-cycle three-phase 2,300-volt condensing steam turbine set from the Allis-Chalmers Co., the contract being signed on December 16th, 1909, and the machine ready for erection was shipped from the works in seven days from the signing of the contract—the transaction being, we should imagine, a record one in point of time.

According to *Electric Traction Weekly*, the Pay-as-you-Enter Car Corporation, New York, is supplying 100 cars for the Third Avenue Railway, New York; the Public Service Corporation, of New Jersey, has also ordered 100 cars of this type, and the Cincinnati Traction Co. is equipping all its cars on this model.

TELEGRAPH and TELEPHONE NOTES.

Australia.—SYDNEY.—Great dissatisfaction is expressed regarding the Sydney telephone service. It is stated in the local Press that the system is greatly overloaded—it has been for some years—and the difficulty of getting through to subscribers on junction lines renders the service practically useless.

MELBOURNE.—Wheatstone automatic instruments have been brought into use on the Sydney-Brisbane line.

Cables Interrupted and Repaired.—Interrupted: Paramaribo-Cayenne, February 3rd; Swakopmund-Mossamedes, February 5th; Lagos-Bonny, February 5th. Repaired: Lagos-Bonny, February 7th.

Overhead Telephone Wires.—For many years the Croydon Borough Council has objected to overhead telephone wires, and at the present time 11 applications from the Postmaster-General for permission to erect poles are outstanding, dating from February of last year. These concern 12 roads. On Monday it was reported that the Postmaster-General had served a notice under the Telegraph Acts, 1863, calling upon the Council to give its consent, failing which he would apply to the County Court Judge of the district to hear and determine the difference in the manner prescribed by the Telegraph Act, 1878. The Council resolved to defend any proceedings that might be taken.

Wireless in the Pacific.—The report of the conference of representatives of the Commonwealth, New Zealand, the High Commissioner of the Western Pacific, Fiji, the Admiralty, and the Pacific Cable Board, convened to consider and report on the establishment of wireless telegraphy in the islands of the Pacific, contains the following recommendations:—

That high-power wireless stations be established at or near Sydney, Doubtless Bay (N.Z.), Suva (Fiji), and Ocean Island.

That medium-power stations be established at Tulagi (Solomon Islands), and Vila (New Hebrides).

That the proposed system be established and maintained under State control, or through a State agency.

That the costs of construction be apportioned between the various Colonies and the Imperial Government.

It was considered that the cost of the high-power stations would not be less than £12,000, and of the medium power stations £6,000, both exclusive of buildings. The buildings for each high-power station may cost from £1,500 to £2,000, and for each medium power station from £1,000, according to the locality. Based on the foregoing assumptions, the cost of the scheme governed by these proposals and the manner in which the cost is to be apportioned between the several Governments will be approximately as follows:—

Fiji, Ocean Island, Suva, Tulagi, and Vila, total cost, £42,000. Apportionment: Imperial Government, £23,334; Government of New Zealand, £2,333; Government of Fiji, £3,500; Government of the Commonwealth, £12,833.

It was proposed that the costs of constructing, maintaining, and operating the stations at Doubtless Bay and Sydney should be borne by the Governments of New Zealand and the Commonwealth.

It is reported in the *Sydney Morning Herald* that while conferences are being held to discuss the all-red installation of wireless telegraphy in the Pacific, the German Protectorates will shortly be in actual possession of a wireless service.

Wireless Telegraphy.—Reuter telegraphs that the Alaska-Pacific liner *Kentucky*, on her maiden voyage from New York to Pacific ports, having sent a message that she was sinking 240 miles off Cape Hatteras, several steamers hastened to her assistance. The steamship *Alamo* reached her first and took off her crew. The vessel afterwards foundered.

Wireless telegraph messages were exchanged between Baltimore and Chicago for the first time on January 5th.—*Electrical World.*

Storm warnings are now being transmitted along the coast and to ships at sea through an arrangement between the telegraph companies and the naval wireless station at Newport, U.S.A.

CONTRACTS OPEN and CLOSED.

OPEN.

Australia.—MELBOURNE.—Seven sections of branching multiple magneto switchboard for the P.M.G. See "Official Notices" January 7th.

SYDNEY.—March 9th. Magneto-switchboards for metallic lines and switchboards for private branch exchanges for common-battery working, in accordance with schedule N.S.W.E.E., 114/09 for the P.M.G. Departmental Stores.

Telephone switchboards for New South Wales, and poles (iron or steel) for Western Australia, for the P.M.G. See "Official Notices" February 4th.

Wire testing machine, for the P.M.G.'s department in Western Australia. See "Official Notices" February 4th.

One electrically-driven dust extractor for the P.M.G.'s Department in Queensland. See "Official Notices" to-day.

Beckenham.—February 21st. House cut-outs and service boxes, for the U.D.C.

Belfast.—February 21st. Low-tension insulated V.R. cable for one year, for the Tramways and Electricity Department. See "Official Notices" January 28th.

A year's stores for the Tramways and Electricity Committee. See "Official Notices" January 28th.

Belgium.—March 23rd. La Société Nationale des Chemins de Fer Vicinaux (14 Rue de Science, Brussels) is inviting tenders for the supply of the electrical energy required for the electric railways in the Bruges district.

Blackburn.—February 16th. Stores for the Electricity and Tramways Departments. See "Official Notices" January 28th.

Blackpool.—2,500 yd. of ·5 low-tension single cable (600 volts) for the Electricity Department. See "Official Notices" January 28th.

Carlisle.—March 1st. Two 500-KW. reciprocating steam engine-driven dynamo sets, with ejector condensers, for the Corporation. See "Official Notices" to-day.

Germany.—February 24th. The Prussian State Railway authorities in Cologne are inviting tenders for the supply of 216 tons of galvanised-iron wire, 9·7 tons of insulated wire, and 84,000 metres run of telegraph wire.

The municipal authorities of Dessau are about to invite tenders for the establishment of a central electricity generating station in the town for lighting and power purposes, at an estimated cost of £125,000.

Gillingham.—February 28th. Cables, lamps, meters, &c., for the Council; new iron oil tank. See two "Official Notices" to-day.

Glasgow.—February 16th. Three electric motors, machine tools, shafting, gearing, tools, &c., for the workshop at the Shieldhall Outfall works for the Corporation Sewage Department. Consulting engineer, Mr. W. D. Hamilton, 59, Bath Street, Glasgow, from whom specification, &c., can be obtained. Deposit £2 2s.

Grimsby.—February 19th. Eighty flame arc lamps for the Corporation. See "Official Notices" February 4th.

Heckmondwike.—February 16th. Evaporative condensing plant for the Electricity Committee. See "Official Notices" to-day.

Hereford.—February 26th. Installation of fire alarm bells at the Herefordshire Training College. See "Official Notices" to-day.

Hornsey.—February 19th. Meters, cables, &c., for the T.C. See "Official Notices" February 4th.

Ilford.—February 22nd. Meters, cables, lamps, carbons, &c., for the Electricity Works, for one year. See "Official Notices" to-day.

India Office.—February 15th. The Director-General of Stores, India Office, Whitehall, S.W., is inviting tenders for electric cranes, and wheels and axles.

Ipswich.—February 19th. General stores for the Corporation electric supply and tramway departments, for a year. F. Ayton, chief engineer and manager.

Leeds.—February 28th. Annual contracts for coal, cables, meters and other stores for the Corporation. See "Official Notices" January 28th.

February 21st.—Materials for the Corporation Tramways Committee. J. B. Hamilton, general manager.

London.—Bermondsey.—February 14th. Stores for the Electricity and Destructor Works, for the B.C. See "Official Notices" January 28th.

L.C.C.—February 23rd. Wiring and fittings for the electric lighting of a number of elementary schools. See "Official Notices" to-day.

St. Marylebone.—February 16th. Various materials for the Council's Electricity Department for one year. See "Official Notices" February 4th.

St. Pancras.—February 28th. Arc lamp carbons for the B.C. See "Official Notices" January 28th.

West Ham.—February 17th. Electrical supplies for the Council. See "Official Notices" January 28th.

Lowestoft.—The Corporation electrical engineer is to obtain tenders for a complete set of condensing plant.

Manchester.—February 22nd. General stores for the Tramway Department. See "Official Notices" to-day.

Morecambe.—February 12th. Superheaters for two Lancashire boilers for the Electricity Department. See "Official Notices" February 4th.

Newport (Mon.).—March 8th. E.L. fittings for the Board of Guardians. I. Thomas, clerk, Queen's Hill.

Norway.—February 18th. The Norwegian State Railway authorities want tenders for telegraph material. Particulars may be obtained at the Commercial Intelligence Branch of the Board of Trade.—*Board of Trade Journal.*

Oldham.—February 16th. Electric lighting, &c., installation, switchboard, testing panel, workshop motors, &c, for the Hollinwood Depôt of the Corporation Tramway Department. See "Official Notices" January 28th.

The Tramways Committee has instructed the Borough Surveyor to prepare plans and specifications and advertise for tenders for extending the Ripponden Road tramways to the borough boundary at Grains Bar.

Portsmouth.—February 14th. Various goods, including electrical and tramway materials, for the Tramways Committee, also coal for the same Committee. See two "Official Notices" February 4th.

Roumania.—March 15th. The municipal authorities of Tecuieu are inviting tenders for the concession for the electric lighting of the town.

Spain.—March 14th. 60 years' tramway concession in north-east Barcelona—from the Calle de Caspe to Vallcarca. Tenders to Dirección General de Obras Publicas, Ministerio de Fomento. Deposit £216. Local representation necessary. An application already lodged will have preferential rights. For further particulars see *Board of Trade Journal.*

Tenders have just been invited by the municipal authorities of Zufre (province of Huelva) for the concession for the electric lighting of the town during a period of 8 years.

Stockton-on-Tees.—February 15th. Stores for the Corporation Electricity Committee for a year. Borough Electrical Engineer.

Swindon.—February 19th. Steam coal for the electricity works for the Corporation. See "Official Notices" February 4th.

February 26th.—Electrical and tramway equipment accessories, fuse and service boxes, &c., for the T.C., for a year. See "Official Notices" to-day.

Walthamstow.—February 25th. Stores for the U.D.C. Electricity and Tramways Departments for 12 months. See "Official Notices" February 4th.

Watford.—March 1st. Paper-insulated cables for the U.D.C. Electricity Department. See "Official Notices" to-day.

Wimbledon.—February 28th. Various materials for the Corporation Electricity Department. See "Official Notices" to-day.

CLOSED.

Belgium.—Nine concerns—one each French and British (the latter being Callender's Cable Co., of London), submitted tenders to the Société Nationale des Chemins de Fer Vicinaux, of Brussels, for the supply of the armoured underground cables required for the local electric railways in the centre district, the lowest being that of the Société des Ateliers de Constructions Electriques du Nord et de l'Est, of Jeumont, France.

London.—Stepney.—The Electricity Supply Committee received tenders as below for 1,000 50-ampere fuse-boxes:—

Reason Manufacturing Co., Ltd. .. .. (accepted)	1s. 6d. each.
W. Lucy & Co.	1s. 6d. ,,
Crompton & Co., Ltd.	1s. 7d. ,,
Johnson & Phillips, Ltd.	1s. 8½d. ,,

For boilers and accessories the tenders were:—

E. Danks & Co. (Oldbury), Ltd. ..	£13,461	(A: Forced draught, travelling bar grate).
Do. do. ..	13,761	(**B: Ditto, with improved type of boiler**).
Do. do. ..	13,690	(C: Chain grate).
Do. do. ..	13,960	(D: Ditto, with improved type of boiler).
Clarke, Chapman & Co., Ltd. ..	16,382	
Babcock & Wilcox	16,960	(Boilers exactly similar to those now installed).

The Borough Electrical Engineer and Manager recommends the acceptance of "B" tender.

The tenders received for turbo-generator and accessories, converting machinery, switchgear, &c., were as follow:—

	£	Alternator.	Remarks.
C. A. Parsons & Co. ..	18,978	Bruce Peebles B size.	*Smaller than existing alternator at Lime-house.
Do. (recom.)	19,091	Bruce Peebles A size.	*Alternator interchangeable with existing machine at Lime-house.
Do. ..	19,198	Westinghouse A type.	
Do. ..	19,403	Westinghouse B type.	
Do. ..	19,518	Dick, Kerr.	
Do. ..	19,614	Parsons.	
Richardsons, Westgarth and Co.	19,279	Bruce Peebles B size.	*See remark above.
Do. ..	19,594	Bruce Peebles A size.	*See remark above.
Do. ..	19,405	General Electric.	
Do. ..	19,527	Siemens.	
Do. ..	19,601	Elec. Construc.	
Brit. Westinghouse Co.	19,300	Westinghouse ordinary.	
Do. ..	19,450	Westinghouse compounded.	
Do. (alternative, not as specified)	18,920	Westinghouse ordinary.	Condenser not to specification.
Do. (alternative, not as specified)	19,070	Westinghouse compounded.	Condenser not to specification.
James Howden & Co. ..	19,410	Bruce Peebles B size.	*See remark above.
Do. ..	19,466	Bruce Peebles A size.	*See remark above.
Do. ..	19,600	Siemens.	
Do. ..	19,689	Dick, Kerr.	
Do. ..	19,800	Brown, Boveri.	
Brush Elecl. Eng. Co. ..	19,682	Brush Co.	
Do. (alternative, not as specified)	19,582	Do.	Condenser not to specification.
Willans & Robinson, Ltd.	19,966	Bruce Peebles.	Duplicate of existing set. Spares included to value of £221 would not be required.
Do. (alternative, not as specified)	19,503	Do.	Condenser not to specification.
Do. (alternative, not as specified)	19,506	Do.	Disk and drum turbine. Condenser not to specification.
Brit. Thomson-Houston Co.	20,509	Own make.	
Lahmeyer Electrical Co.	20,759	Do.	
G. Braulik	20,821	Maffer-Schwartzkopff Werke.	

The tender of Messrs. C. A. Parsons & Co., at £19,091, is recommended for acceptance.

For cable required "during the period ending December 31st, 1912," the following tenders were submitted. The figures are the totals, assuming schedule quantities of lead-covered cables are ordered. The specification includes a clause providing for the adjustment of the price of cable according to the market prices of copper and lead:—

Henley's Telegraph Works Co.	(recommended)	£8,095
British Insulated and Helsby Cables, Ltd.		8,288
W. T. Glover & Co., Ltd.		8,268
Siemens Bros. Dynamo Works Co., Ltd.		8,287
St. Helens Cable Co.		8,335
Callender's Cable and Construction Co., Ltd.		8,353
Western Electric Co., Ltd.		8,574
India-rubber, Gutta-percha & Tel. Works Co.		(unable to tender)

The following were the tenders for conduits, troughs and covers to December, 1912. The figures are the totals, assuming estimated quantities are ordered:—

		Conduits.	Troughs and covers.
Siemens Bros. Dynamo Works, Ltd. ..	(recommended)	£4,281	£878
Henley's Telegraph Works Co., Ltd.		2,863	876
Albion Clay Co., Ltd.		2,880	(Not quoted for.)
W. T. Glover & Co., Ltd.		2,645	£950
British Insulated and Helsby Cables, Ltd.		(Unable to tender.)	
Callender's Cable and Construction Co., Ltd.		Do.	
India-rubber, Gutta-percha and Tel. Works Co., Ltd...		Do.	
Western Electric Co., Ltd.		Do.	
St. Helens Cable Co., Ltd.		(No tender received.)	

Two thousand tons of Kingsbury Ryder beans have been ordered from Messrs. Rickett, Cockerell & Co., at 13s. 3d. per ton.

L.C.C.—The following tenders were received by the Highways Committee for roadwork and platelaying, exclusive of supply of rails and special trackwork, for the Brockley Road to Forest Hill conduit tramways:—

J. Mowlem & Co., Ltd.	(recommended)	£39,792
Dick, Kerr & Co., Ltd.		41,749
Kirk & Randall		41,804
W. Manders		45,429
A. N. Coles		54,275

Engineer's estimate, £42,607.

For four electric motor-driven travelling cranes, for the second section of the car-repair depôt, the following tenders were received from selected firms :—

S. H. Heywood & Co., Ltd. .. .. (recommended)	£2,285
Do. alternatives	2,325
	2,437
Applebys, Ltd.	2,412
Ransomes & Rapier, Ltd.	2,490
Thos. Broadbent & Sons	2,586
Royce, Ltd.	2,576
Babcock & Wilcox, Ltd.	2,585

Chief officer's estimate, £2,400.

The Committee has accepted the tender of the British Thomson-Houston Co., Ltd., for a pair of equipments for coupling two single-deck electric cars for use on the Council's tramways. The Board of Trade has sanctioned the use of these cars, by way of experiment, on the Euston Road to Hampstead Heath tramways, between 10 a.m. and 5 p.m.

The Education Committee has received the following tenders for installing electric lighting and bells at the Poplar divisional offices :—

E. Newbald & Co. .. .. (accepted)	£133	0
Sweet Bros.	134	0
Johnson & Phillips, Ltd.	136	0
G. Weston & Sons	143	0
Tilley Bros.	148	10
Stegmann & Co.	153	0
British Westinghouse Electric and Manufacturing Co.	199	0

The chief engineer's estimate comparable with the tenders was £156.

Bradford.—The Corporation Electricity Committee has accepted the tenders of the Edison & Swan United Electric Light Co., Ltd., and Pope's Electric Lamp Co., Ltd., for incandescent electric lamps for free distribution to consumers.

Bridlington.—The Council recently decided to intall a mixed-pressure turbo, and the undermentioned are the firms who tendered for same :—

British Westinghouse E. & M. Co., Ltd.; **Willans & Robinson, Ltd.** (accepted), £2,185; Belliss & Morcom; Howden & Co., Ltd.; Richardsons, Westgarth & Co.; P. J. Mitchell & Co.; Parsons, Ltd.

The accepted tender is for a 300-KW. mixed-pressure turbo of Messrs. Willans & Robinson's make (disk and drum), coupled to a Siemens generator; the price is inclusive of pipework and switch-gear.

Colchester.—The T.C. has accepted the tender of Henley's Telegraph Works, Ltd., for cable, at £199, and that of Messrs. Crompton & Co., Ltd., for a latest type dynamo, at £360.

Cromer.—The Protection Commissioners have accepted the tender of the Cromer Electricity Supply Co., for electrical work on the Pier.

Eastbourne.—The following is a list of tenders received for condensing plant and pipework for the Corporation Electricity Works :—

E. Scott & Co., Ltd	£3,150
Davenport Engineering Co.	2,640
Prockter & Kenyon, Ltd.	2,607
Belliss & Morcom, Ltd.	2,500
Richardsons, Westgarth & Co., Ltd.	2,464
J. P. Hall & Sons, Ltd.	2,450
Browett, Lindley & Co.	2,365
Worthington Pump Co., Ltd.	2,348
Mirrlees, Watson & Co., Ltd.	2,340
British Westinghouse Electric and Manufacturing Co...	2,280
Midland Engineering Co., Ltd.	2,196
W. H. Allen, Son & Co., Ltd.	2,140
I. Storey & Sons, Ltd.	2,132
Brush Electrical Engineering Co., Ltd.	2,014
Willans & Robinson, Ltd. .. .. (accepted)	1,888
J. Thompson	1,779
C. A. Parsons & Co., Ltd. .. (Not to specification)	1,959
Michael, Pal & Co., Ltd... .. .. Do.	2,173

East Ham.—The T.C. has accepted the tender of Messrs. Dick, Kerr & Co., for another balancing machine, at £320, for the generating station.

Eccles.—With reference to the notice appearing in this column last week, we understand that the Corporation order there mentioned, has been placed with Messrs. Browett, Lindley & Co., Ltd., of Patricroft, for their own make of engine, with Westinghouse dynamo and Körting condenser, not as stated by us.

Glasgow.—The T.C. Committee on Tramway Works and Stores has recommended acceptance of the following offers :—

Double lead sheathed telephone and test cables.—British Insulated and Helsby Cables, Ltd.
Rubber-insulated cables.—W. T. Glover & Co., Ltd.
Galvanised corrugated sheets.—P. and W. M'Lellan, Ltd.

India.—According to the *Indian and Eastern Engineer*, the Madras Corporation has entrusted the work of the electric lighting of the city to Messrs. Siemens Bros. The Bombay Government has accepted the tender of Messrs. Greaves, Cotton and Co., for the electric installation at Ganeshkhind, Kirkee, amounting to about rupees one lakh. The generating station will contain three Gardner high-speed oil engines direct coupled to 16-KW. compound dynamos, a battery and switchboard. The same firm have also received the order for the electric lighting of the Cama and Allbless hospitals.

Lowestoft.—The Electricity Committee has accepted the tender of Messrs. Siemens Bros. for meters for one year, at schedule prices; and that of Messrs. Lucy & Co., for house cut-outs at 2s. 11d. and 5s. 5d. each.

Portsmouth.—The T.C. has accepted tenders as follows :—

International Electric Co.—200 switchboard cords, at 1s. 11½d. each.
British Insulated and Helsby Cables, Ltd.—Wire, at £15 15s. per mile.
British Westinghouse Electric and Manufacturing Co., Ltd.—40-KW. transformers, at £57 each.

FORTHCOMING EVENTS.

Physical Society.—Friday, February 11th. At 8 p.m. At the Imperial College of Science, South Kensington, S.W. Annual general meeting; Presidential address.

Royal Institution.—Friday, February 11th. At 9 p.m. Discourse on "Electrical Properties of Sand," by Mr. C. E. S. Phillips.
Saturday, February 12th. At 3 p.m. Lecture on "Electric Waves and the Electromagnetic Theory of Light," by Prof. Sir J. J. Thomson (Lecture I).
Thursday, February 17th. At 3 p.m. Lecture on "Illumination: Natural and Artificial," by Prof. S. P. Thompson. (Lecture I.)
Saturday, February 19th. At 3 p.m. Lecture on "Electric Waves and Electromagnetic Theory," by Prof. Sir J. J. Thomson. (Lecture II.)

Institution of Electrical Engineers (Glasgow Section).—Saturday, February 12th. At 7.30 p.m. At the Grosvenor. Annual smoking concert.

North of England Institute of Mining and Mechanical Engineers.—Saturday, February 12th. At 2 p.m. At the Wood Memorial Hall, Newcastle. Paper on "Electric Shot-Firing," by Mr. J. Douglas, to be discussed.

Institution of Electrical Engineers (Manchester Students' Section).—Tuesday, February 15th. At 7 p.m. At the Municipal School of Technology, Manchester. Discussion with the Manchester and District Junior Gas Association on "Gas *v.* Electricity for Industrial and Domestic Power and Heating Purposes."

Electro-Harmonic Society.—Tuesday, February 15th. At 8 p.m. At the Holbo Restaurant. Concert. Ladies' night.

Illuminating Engineering Society.—Tuesday, February 15th. At 8 p.m. At the Royal Society of Arts. Discussion on "Glare, its Causes and Effects," to be resumed.

Institution of Electrical Engineers (Students' Section).—Wednesday, February 16th. At 7.45 p.m. At 92, Victoria Street, S.W. Paper on "Alternating *v.* Direct Current Supply from Sub-stations," by Mr. H. W. Gregory.

Institution of Electrical Engineers (Birmingham Section).—Wednesday, February 16th. At 7.30 p.m. At the University, Birmingham. Paper on "The Influence of Various Cooling Media upon the Rise in Temperature of Soft Iron Stampings," by Mr. R. D. Gifford; and discussion on Mr. H. E. Yerbury's paper on "Equitable Charges for Tramway Supply."

Institution of Electrical Engineers (London).—Thursday, February 17th. At 8 p.m. At the Institution of Civil Engineers. Paper on "Electric Clocks," by Mr. F. Hope-Jones.

Tramways and Light Railways Association.—Saturday, February 18th. At 7 p.m. At the Gaiety Restaurant. Annual general meeting. Annual dinner and smoking concert at 7.30 for 7.45.

THE ELECTRICAL ENGINEERS
(LONDON DIVISION).

THE following orders are issued :—

Commanding Officer—COL. R. E. B. CROMPTON, C.B.

Monday, February 14th.—"A" Company. Recruits' infantry drill, 6 to 7 p.m.; technical drill, 7 to 9.30 p.m.

Tuesday, February 15th.—"B" Company. Technical drill, 7 to 9.30 p.m.

Wednesday, February 16th.—Gymnasium, 6.30 to 9.30 p.m.

Thursday, February 17th.—"C" Company. Technical drill, 7 to 9.30 p.m.

Friday, February 18th.—"D" Company. Recruits' infantry drill, 6 to 7 p.m.; technical drill, 7 to 8.45 p.m.; infantry drill, 8.45 to 9.45 p.m.

Saturday, February 19th.—"A" Company. Week-end run at Coalhouse Fort. Parade at Fenchurch Street Station, 3.15 p.m. Dress as usual.

(Signed) P. H. CAMPBELL, Capt. R.E. and Adjutant,
For O.C. E.E., L.D.

NOTES.

Annual Dinner of the West Ham Electricity Department.—A very enjoyable evening was spent on Thursday evening the 27th ult., by the members and friends of the West Ham electricity department, on the occasion of their annual dinner at the Gaiety Restaurant. Among those present, in addition to Mr. H. H. Cousens (borough electrical engineer), who presided, were Alderman Spratt (deputy-mayor), Alderman Crow (chairman of the Tramway and Electricity Committee), Alderman Littler (ex-mayor), Mr. H. E. Blain (tramway manager), and Mr. A. Hugh Seabrook (late borough electrical engineer). After a capital dinner the usual loyal toasts were honoured, the rest of the evening being occupied with a well-arranged musical programme, interspersed with a few toasts.

Mr. Seabrook, in proposing the toast of "The Mayor and Corporation of West Ham," humorously referred to his present independent position, and praised the public spirit which had throughout the past few years ruled the Corporation in its policy of making cheap power a reality in the borough. He felt sure that not only in the financial results of the undertaking itself, but in the new industries which were being planted in their midst, the borough would be well repaid for its foresight and enterprise. If 20 other boroughs were to adopt the same thoroughgoing forward policy in regard to their electricity undertakings, he was sure that the districts concerned would benefit, while the prospects of the whole electrical industry would be greatly improved. Mr. Seabrook concluded by saying that the three years he had spent at West Ham were among the pleasantest of his life; they had not always agreed, it was true, but whatever their differences they

remained as good friends as ever. Alderman Spratt, in replying for the Corporation, spoke of the value which he placed upon Mr. Seabrook's good opinion, and then reminded the audience of the rapid strides which had been made by the borough since its incorporation 23 years ago. Although it had become somewhat notorious on account of its trading propensities, yet it had the smallest debt of any town of equal size in the country.

The toast of the evening—viz., that of "The Electricity Department," was proposed by Alderman Crow. After acknowledging the ability displayed both by Mr. Seabrook, their late chief executive officer, and also by Mr. Couzens, their honoured chairman and present borough electrical engineer, the speaker went on to refer to the wonderful progress which was being made by the undertaking. During the nine months of the present financial year, they had sold 2½ million units more than in any previous year and earned £5 600 more revenue. Some criticism had been in the past levelled against the department on the score of its under-assessment, but £5,200 had been added to the rateable value of the undertaking during the year, and still it hoped to earn a profit. He was glad to say that the committee had increased the salaries of many of their staff, and he hoped that all would continue to do their best to make the department as prosperous as possible. In reply, Mr. Couzens said that whatever the success of the present year's working might be, the greater part of the credit was due to his predecessor, Mr. Seabrook. He felt he must thank the members of the staff for the loyal way in which they had helped him, and he was proud of the success which many of them had achieved in their several departments. In this connection he must mention Mr. Lloyd Jones, who, in the generating department, had got results which, he believed, were unequalled in the country. The sales department had been established by Mr. Seabrook, and he was convinced that much of the success of the undertaking was due to the energetic manner in which it had been developed.

Mr. Lloyd Jones proposed the toast of the "Visitors," which was responded to by Mr. Blain.

Much credit was due to the Committee who had the arrangements for the evening in hand.

New Regulations.—The Government of Cape Colony, to which Mr. J. Denham is the electrical adviser, has formulated a number of additional regulations relating to the supply and use of electricity for lighting and power, which will come into force on May 1st, 1910.

Clauses have been drawn up specifying the qualifications of drivers on electric tramcars, and providing that, on any accident occurring through the default of a driver, the Government shall have power to call upon the undertakers to dismiss him from their service; power is also taken to enable the Government Electrical Inspector to test the fitness of any driver to perform his duties.

Other clauses require that where incandescent lamps are run in series, the consumer's wires shall be completely enclosed in strong metal casing, which, together with the switches and lampholders, shall be efficiently earthed, and precautions shall be taken to prevent danger of shock or fire.

Restrictions are placed upon the giving of extra-high-pressure supply to consumers. Overhead lines are to have a factor of safety of 5, and steel structures of 6; overhead lines for high pressure must have Government sanction. Sub-stations must be in the sole occupation of the undertakers. A consumer to whom the undertakers refuse to give a supply, may appeal to the Government, and if the inspector reports that his installation is in a satisfactory condition, the supply must not be withheld. On a three-wire system of mains where the pressure between adjacent conductors exceeds 125 volts, the neutral must be earthed at one point, and a continuous record of the earth current must be taken, which must not exceed $\frac{1}{1000}$ of the maximum supply current.

A notice has also been published by Mr. Denham, calling attention to certain dangers in connection with electric lifts. Contact-makers in the main circuit are recommended for each floor, so that the gates must all be properly closed before the cage can move, and lift attendents are warned not to start the cage simultaneously with slamming the gate, lest the hand or clothing be caught in the lattice work, and the other hand dragged away from the controller before the cage can be stopped. Regular inspection and testing of the automatic switches, brake gear and safety devices are recommended.

The Progress of the Lancashire Power Co.—The annual dinner of the staff, consumers, and proprietors of the Lancashire Electric Power Co. was held at the Mosley Hotel, Manchester, recently. There were also present a large number of the officials of the various local authorities in whose areas the company have operating powers, and gentlemen representing owners of wayleaves on the lines of the company's electric supply. Mr. C. D. Taite, M.I.E.E., chief engineer and manager, presided, and he was supported by Sir Robert Hampson, ex-Lord Mayor of Liverpool (director), and other gentlemen.

Mr. John Buckley, of Prestwich Clough Bleachworks, in proposing "The prosperity of the Lancashire Electric Power Co.," said that as one of the most recent users of electrical power, his sole regret was that he had not adopted electricity years ago. Electricity as a great factor in Lancashire industrial life had come to stay.

Sir Robert Hampson acknowledged the toast. Last year he had felt it his duty to point out, as a director of this great company, that it was about to be re-organised on a new and extended basis under the advice of Mr. H. F. Parshall, of London, who was now chairman of the directors. A large amount of new capital had been found. Many new agreements had been entered into, many Lancashire Provisional Orders taken over, some of which were now in operation, and two additional Lancashire directors had joined the board, one of whom was Mr. T. Lever Rushton, J.P., of Bolton, with a view to bringing the company more directly into touch with the commercial condition of things in the county. Twelve months ago he (Sir Robert) held out the hope of a prosperous year in their work. In spite of the unparalleled depression of trade in all directions, that hope had been most amply realised. The maximum load at their power station had increased by fully 50 per cent., their actual output by 33 per cent., and their revenue by 50 per cent., and the general indication of things for the next 12 months was that that rate of increase would be fully maintained. Not a single firm had returned to steam from electric driving. If the present prospects of increased output at the Outwood generating station were realised, it would be necessary to make extensive additions in the immediate future.

Mr. Taite, the chief engineer and manager, proposed the health of the visitors. He said that during the last few weeks the people of Lancashire had had many remedies propounded for the improvement of trade, but he thought none of the political orators had hit upon so important a remedy as those firms which had become consumers on the mains of the Lancashire Electric Power Co. He meant that in all seriousness, as it happened that those firms had, many of them, been kept wonderfully busy, while those who were attached to the old steam drive had been much less so. Surely, then, electrical consumers had hit upon an important method of retaining and increasing their trade. In associating the name of Mr. Young (Holcombe) and Mr. Salter (South Lancashire Tramways) with the toast, he felt constrained to say that had the Lancashire Electric Power Co. been operating its powers before the S. L. Tramways Co., there would have now been one generating station less. By that he meant that the tramways company would have taken current from the Power Co.

Mr. Young, in responding for the guests, said the electrification of their works was brought about by a fire which burned them out. They restarted with a small installation, and had gone on making additions until now they had only one small steam engine in the works. The company's supply and the manner of installing it had been a great success from the beginning, and they could not imagine going back to the steam drive. He found that was the testimony of all electrical users.

Mr. Salter also responded, and said that for ten years past he had been endeavouring to educate local authorities in rural areas to the advantages of electrical bulk supply from companies, and Mr. Taite, who had had only two years of that experience, as his labours were previously in municipal service, was now reaping the benefit. It was unfortunate that some local authorities should look upon companies as interlopers who would stop progress and industrial development, while the exact opposite was the fact. Local authorities were now ready to approach him and ask his company to carry their tramways into their districts. Why? Because they had come to realise that tramways benefited those districts. In the same way they were asking the Lancashire Power Co. to carry their mains quickly into the districts where they had now acquired operating powers, because wherever those mains were carried the districts benefited. He so far recognised the value of the Lancashire Electric Power Co. in his part of the county, that if they would agree to supply his tramway company as cheaply as they generate electricity themselves, he would scrap his plant and make good the suggestion which Mr. Taite had thrown out in his speech.

Miners' Electric Lamps.—Great difficulties have hitherto been encountered with regard to the introduction of electric lamps for miners in the Rhenish-Westphalian collieries, as the lamps so far made have been too heavy, and also had other defects. A former mining manager now residing at Hanover is reported to have devised a lamp which has been reported upon by the testing station of the Westphalian Mines Fund, which stated that the lamp can be regarded as almost perfectly proof against fire-damp. The lamp, however, does not indicate to the miner the presence of fire-damp. On the other hand, the incautious handling of the lamp does not cause harm, and fire-damp cannot be ignited by it. The State mine supervising authorities seem to advocate the introduction of electric lamps on account of fire-damp, and only such lamps are to be used at the Radbod colliery, where a disaster took place some time ago.

Refrigeration Congress.—An International Congress of Refrigeration is to be held at Vienna in October next, from 6th to 12th. The subjects to be discussed are the science of cold; the industrial production of cold; the application of cold to alimentation and to other industries; transport; and legislation. Papers must be submitted to the Association International du Froid through the British Committee. Mr. R. M. Leonard, of 3, Oxford Court, Cannon Street, London, E.C., is the hon. secretary for the United Kingdom.

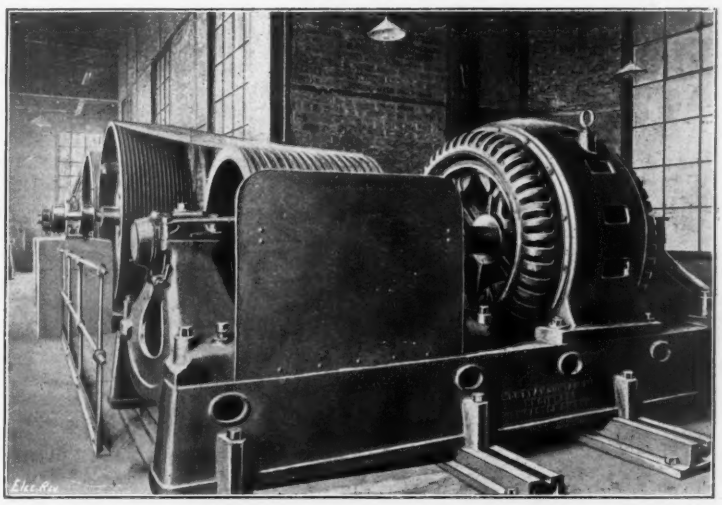
Copper.—The statistical returns for January 31st issued by Messrs. Merton show a slight falling off in price, and a small increase in visible supplies. The figures for the latter are 110,808 tons, as against 109,022 for the end of December, 1909. The increase is in stocks at English ports. It would appear from these indications that buyers are still holding off pending some more decided information as to the American combine. With regard to supplies, the quantity from North America to European ports is considerably above the average; from Spain and Portugal slightly above, from Chile rather below, and from Australia nearly a third below average. These being shipments, however, may be delayed by inclement weather at this time of year.

(*Continued on page* 225.)

THE COLTNESS IRON CO.'S NEW CEMENT PLANT.

Past volumes of the Electrical Review contain many references to the important subject of the utilisation of the waste products of the blast furnace and coke oven, principally as regards the use of surplus heat or gas. One of the most interesting and successful installations on these lines, as regards the blast furnace, and which is also of considerable interest to electrical engineers, is to be found at the Coltness Iron Co.'s works at Newmains, Lanarkshire, where a plant has been installed for utilising the slag from the blast furnaces in cement making. We believe this is the first installation of this kind in Britain, although, of course, slag has been utilised in other ways, notably in the production of artificial manures, for some time past.

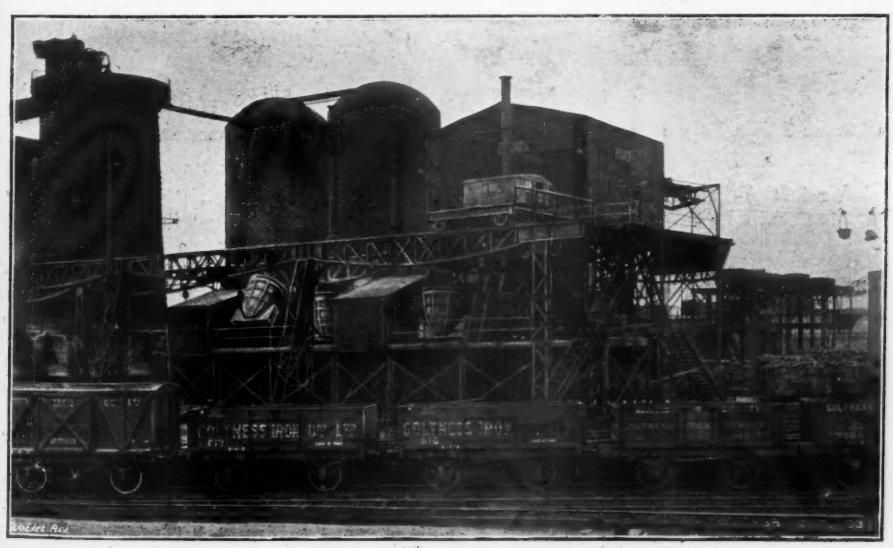
Blast furnace slag and Portland cement have much the same binding compositions, being silicates and aluminates of lime, and this fact has led to much research and experiment, resulting in at least one satisfactory process—*i.e.*, the Collos process, invented by Dr. Heinrich Colloseus, of Berlin, which is being worked under license by the Coltness Co., and is in use at Duisburg, Germany, and at Niagara. From a chemical point of view the process is as follows :—



Scott & Mountain 350 h.p. Motors Driving Ball and Tube Mills.

The molten slag in a condition of high incandescence is impregnated with an alkaline solution, the latter acting as an energetic catalising reagent in relation to the silicates. A further reaction, the outcome of this combination, appears to be that acids evolved under the influence of the high temperature from the aqueous solutions of the salts are in a state of nascence, and that reactions take place in combination with the sulphur originally present in the slag itself, the result being that a very large proportion of the sulphur goes off as sulphuretted hydrogen and sulphur dioxide. The cement, from which uncombined lime is entirely excluded, consists of silicates of lime identical in character with those constituting the essential components of high limed cements, and contains no ingredients whatever beyond those common to all Portland cements.

It consists of running the molten slag from the blast furnaces into 8-ton ladles, which are manipulated by an overhead electric travelling crane (made by Alex. Jack & Co.), which travels along the front of the two rows of blast furnaces.



View of the Granulators.

A filled ladle is carried along by the crane and deposited on one of three tipplers, which stand on a staging adjacent to three granulators.

Each tippler is operated by a 12 to 1 variable-speed motor, and turns over the ladle of molten slag so as to pour the latter slowly on to the granulator. The granulator consists of a water-cooled drum, motor driven, running at a speed of 650 r.p.m., and as the slag is poured, but before it reaches the drum, it is subjected to a water spray containing 5 per cent. of magnesium sulphate, the product, which passes from the drum in the form of small globules, falling through chutes into 8-cwt. buckets, which are carried 350 yards on an electrically-driven Bleichert aerial ropeway, and automatically tipped into a 6,000-ton store house or clinker store adjoining the cement mill.

Here the slag from the various furnaces is intermixed and allowed to cool thoroughly, being then carried in 25-cwt. buckets over a runway supplied by Messrs. Morris and Bastert, into the mill house, and tipped into the hopper of a screw mill, which reduces the clinker to $\frac{1}{4}$ in. or less.

The crushed clinker is then elevated preparatory to being fed into two ball mills for the preliminary grinding, the product being subsequently conveyed into two tube mills on a lower floor, which complete the reduction.

Spiral conveyors and elevators transfer the finished product to a large ferro-concrete store, where it can be graded and automatically weighed while being fed into sacks or casks for railway transport — the railway running alongside the packing building.

From an electrical engineering point of view, the plant is particularly interesting, owing to its being electrically driven and lighted throughout, and because the prime movers represent the most modern practice for work of this kind.

The original electrical plant consisted of two small Belliss

sets situated at the low side of the works; these supplied the current for operating the foundry and other cranes, and also for the arc and incandescent lighting throughout the works, at a pressure of 220 volts. On extending the plant, it was decided that the cranes and auxiliary motors throughout the works, together with the lighting, should still be supplied at a pressure of 220 volts, but on account of the heavy outlay in cables required for supplying the cement plant, it was decided that a three-phase high-tension scheme with 2,500 volts between phases and 25 cycles would be the most suitable for the purpose. A feeling that the plant might also be used for transmission purposes to surrounding collieries in the future, was a factor in the decision.

The Coltness Co. having a considerable amount of blast furnace gas which had formerly been wasted, installed three gas engines of the Cockerill-Westgarth type, two of them being for blowing purposes, and the third coupled to a 1,000-KVA. Scott & Mountain alternator, being utilised for driving the ball and tube mills, conveyors, &c., in the cement mill.

The gas-electric set is designed for a constant load of 1,250 B.H.P., the gas supply being first passed through a by-product recovery plant and finally cleaned in Summerlee patent cleaners.

The main and outer bearings of the engine, also the crank end of the connecting rod, are fitted with the flush system of continuous lubrication, which secures an exceptionally low oil consumption. The governor system varies the quality of gas admitted according to the load, and a special hand-gear is fitted to give a varying lift to the gas valves, whereby great sensitiveness in regulation is obtained.

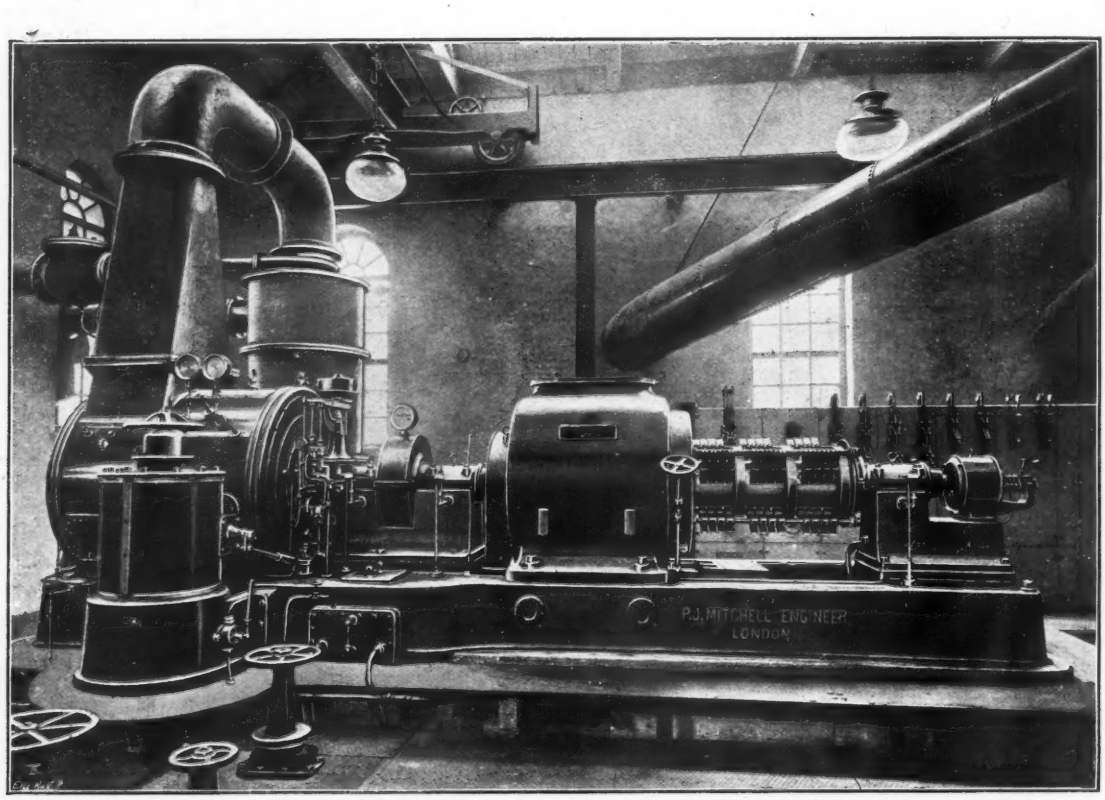
Lodge H.T. type ignition is fitted, giving simultaneous sparks at two distinct points in each cylinder end.

The alternator is of the three-phase slow-speed revolving-field type, giving 850 KW. on a power factor of ·85, 25 cycles and 2,500 volts per phase, at 100 R.P.M.

The magnet wheel is of cast-iron, and is fitted with 30 field magnets bolted to the wheel, and excited from the D.C. plant.

The armature frame, with its windings, weighs 19 tons. The output from this plant is controlled by a switchboard of Messrs. Brash & Russell's make, and supplies two 350-H.P. Scott & Mountain slip-ring motors, running at 375 R.P.M., which drive through ropes, the ball and tube mills. Another motor by the same makers, of 150 H.P., drives the conveyors and elevators, and they have also supplied two vertical spindle motor-driven centrifugal pumps, each of 100 H.P., with a capacity of 1,500 gallons per minute against a head of 130 ft. The motors for these pumps are placed in the blowing house.

The granulators, tipplers, aerial ropeway and overhead cranes are driven by direct-current motors, supplied from a 500-KW. exhaust steam turbine of the Rateau type constructed by Fraser & Chalmers, which is coupled to a 500-KW. Brown-Boveri generator and provided with a Westinghouse Leblanc condenser and Balcke cooling tower. This plant was supplied by Mr. P. J. Mitchell, of Westminster, and is worked by the exhaust steam from three Parsons turbo-blowers, and as the blowing plant is situated in a high portion of the works, about 60 or 70 ft. above the original generating plant, the old and new switchboards are coupled by 1 sq. in. V.B. cables, and the plant arranged to run in parallel if required.



500 KW. EXHAUST STEAM RATEAU-BROWN, BOVERI TURBINE PLANT SUPPLYING THE LIGHTING AND AUXILIARY MOTORS.

In order to facilitate the running of the alternating and direct-current plant, a Scott & Mountain motor-generator has been installed, giving 500 KW. on the direct-current side and a similar output at ·85 power factor on the alternating side. The generator can be used as a synchronous motor, and means are provided on the main switchboard so that it can be run up to speed on the direct-current side, and switched over and run from the gas engine generator, the machine then delivering direct current to the system.

The efficiency of the two machines at full load is 88 per cent or 94 per cent. on each machine.

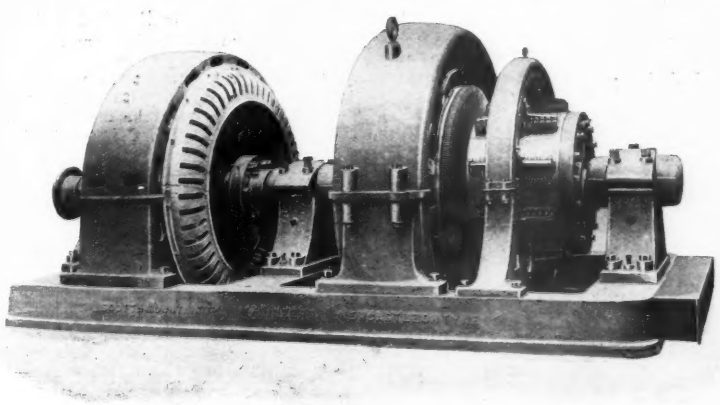
On account of the necessity for running in parallel with the turbo, &c., it was found necessary to install the motor-generator beside the exhaust turbine, H.T. connecting mains being led from this point to the H.T. switchboard in the gas-engine house.

The switchboard for the turbo-generator, &c., was designed and constructed by Messrs. Brash & Russell, of Glasgow, and consists of 11 panels, the dynamo panels situated on the left-hand side being fitted with Ferranti free-handle carbon

break circuit-breakers arranged for a maximum current of 3,000 amperes. On the right-hand side of the board are arranged the panels controlling the H.T. side of the motor-generator. The intermediate panels consisting of feeder panels to the different sub-circuits, viz., condensers, furnaces, lighting, the starting panel for the D.C. side of the motor-generator, and the feeder circuit to the board installed in the old engine house before referred to.

The circuit-breakers on the turbo and D.C. side of the motor-generator panels are of the maximum and reverse type with reverse relays and auxiliary tripping coils, and are all of very massive design, the feeder-panel circuit-breakers being "overload" only. The H.T. side is controlled by a H.T. oil switch arranged with overload and reverse relays in two phases (the neutral point not being earthed), and the board is also fitted with the usual instruments, together with power factor and frequency indicators. The H.T. cables from this board are led to the main board in the gas-engine house, which consists of a H.T. panel controlling the 1,000-KVA. alternator, this being fitted with a H.T. oil switch with overload and reverse relays in two phases, and the usual instruments for indicating and measuring the output; one feeder panel controlling the mains to the cement house, and one incoming feeder controlling the mains from the motor-generator. The board is fitted with a synchroscope so arranged that motor-generator and alternator can be synchronised. At one end of the H.T. board are arranged L.T. distribution panels, for operating the overhead cranes and barring-motors for starting the engines, and the pumps for the cooling water. The board is arranged on a glass-insulated platform, commanding a view of engine house, and the space beneath is occupied by a battery of accumulators for operating the ignition on the gas engines.

The H.T. cables are of bare copper, and are run overhead on poles and carried along the boundary of the works to the cement house. At each end of the line are arranged choking coils, lightning arresters and isolating switches. Inside the cement house is a receiving panel controlled by auto-oil switches, from which the cables lead to the various motor panels, which are of the ironclad pillar type, and fitted with a voltmeter and ammeter, and the usual oil switches with no-volt and overload release. The wiring inside the cement house is carried out in tubing, distribution boxes and switches being fixed at suitable points in the building. Flame arc lamps illuminate the clinker house and other large spaces—while the mill houses, conveyors, &c., are lighted by incandescent lamps. In the mill house, the lighting is arranged with groups of metallic-filament lamps in dust-proof fittings, and an excellent effect is obtained.

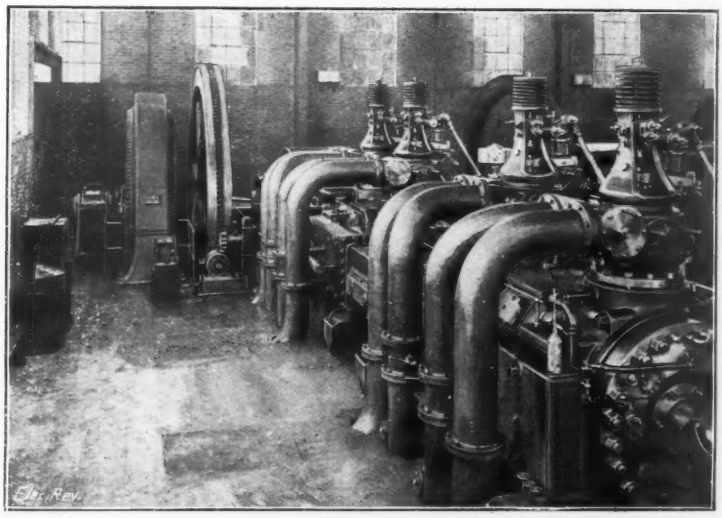


Scott & Mountain Motor-Generator Installed in Blowing House.

The cement works are provided with a well-equipped laboratory, and we understand that the product has successfully passed most stringent tests.

The mills will have a normal output of 1,000 tons of cement per week, in full work, and the results, which are, of course, beyond the experimental stage, are being viewed with much interest locally.

In conclusion, we are indebted to the Coltness Iron Co., also to Messrs. Scott & Mountain, Messrs. Richardsons, Westgarth & Co., and to Messrs. Brash & Russell for assistance in the preparation of this short description.



1,000 KVA. Gas Engine-Alternator Set Supplying the Cement Mill Motors.

THE LOWDEN ROTARY MERCURY HIGH-VACUUM PUMP.

Through the kindness of Messrs. W. Mackie & Co., of 47½, Old Street, E.C., we were recently enabled to inspect a new type of mercury pump which has been designed specially to meet the needs of manufacturers of metal-filament lamps, to whom a very high vacuum is essential.

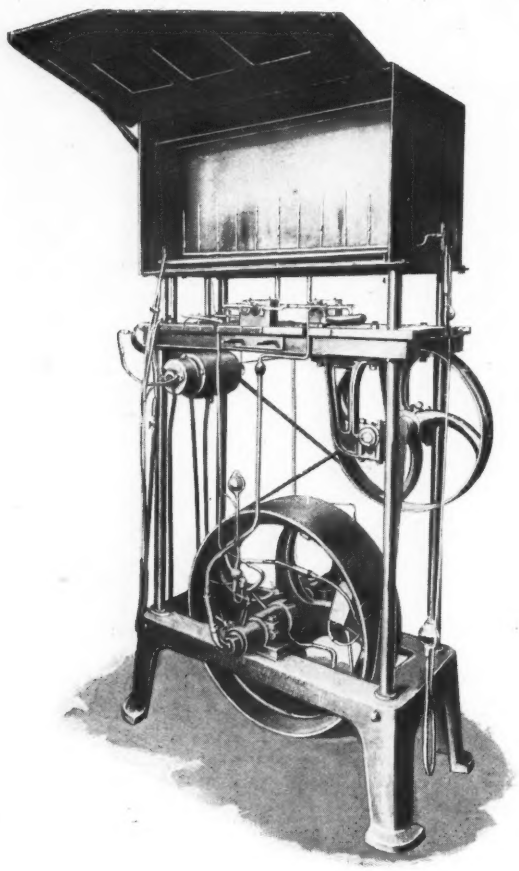
The pump is the invention of Mr. W. T. Lowden, and it consists of two endless circular metal tubes, each with a trap of special design inserted at one point in the circumference.

The tubes are attached to the inside of the rim of a wheel which is rotated by a small motor at a speed of 2 R.P.M.—this speed having proved the most efficient one for the purpose.

Each circular pipe forms a pump, the two being in parallel between the rough vacuum pump and lamps. From one end of each trap a discharge pipe leads to the rough vacuum pump, and in each circular tube a suction pipe enters adjacent to the trap, and connects with the lamps to be exhausted.

The tubes contain sufficient mercury to fill the traps when at the lowest point of the travel, and if we consider the rotation of the tubes, it will be evident, looking at the four diagrams given on page 224, that while a portion of the mercury will always remain as an air seal in the trap, the bulk of it being free, will occupy the lowest point of system, and, acting as a stationary piston, drive the air in front through one section of the trap into the delivery pipe leading to the rough vacuum pump, while at the same time an ever-growing space will exist behind the piston (between it and the trap), creating a strong suction in the pipe leading to the lamps.

Moreover, assuming the trap to be approaching the lowest position, it will be noticed that while the mercury piston expels the air in front of it through the delivery pipe leading from the trap, the mercury itself flows down through the trap, ultimately sealing the suction tube and driving the air sucked into the pump during the previous revolution in front



THE LOWDEN ROTARY MERCURY PUMP.

of it; a little further rotation and the mercury piston is again formed, the suction tube to the lamps is unsealed and the exhausting action behind the piston recommences.

As the traps are arranged at opposite points in the circumference of the wheel, a steady suction is maintained by the pumps in parallel.

It is interesting to note that the suction and delivery pipes lead out from the rotating system through the centre of the axle on the opposite sides of the pump. On the suction or high vacuum side a very ingenious joint has been devised between the moving and fixed portions of the delivery system. The glass tube passing centrally through the axle enters a special gland connected with the suction tube, which latter bends upwards to the vertical, and is filled with a few inches of mercury; attached to the end of the glass tube and rotating with it is a short length of rubber tube, which passes round inside the elbow and vertically upwards for a few inches inside the suction tube to a point above the mercury, which, of course, is an effective seal. An automatic U valve is also provided on the high vacuum side of the pump, which enables the rough vacuum pump to assist the mercury pump at starting.

The process of exhausting metal-filament lamps with the pumping appliances now in general use is a very slow one, requiring the greatest care on the part of the operator to prevent burning of the filaments or blackening of the bulbs.

The Lowden pump, however, can exhaust a set of 20 lamps to the stage at which it is safe to light them, in two or three minutes, as compared with 25 minutes and upwards, required to reach the same stage with other pumps.

After the lamps are lighted, the gases which are driven off from the filaments, are cleared out of the bulbs instantly, so that the filaments are clean, not burnt, and the bulbs are kept clear; the current can be steadily increased up to the maximum without injury to the filaments or bulbs.

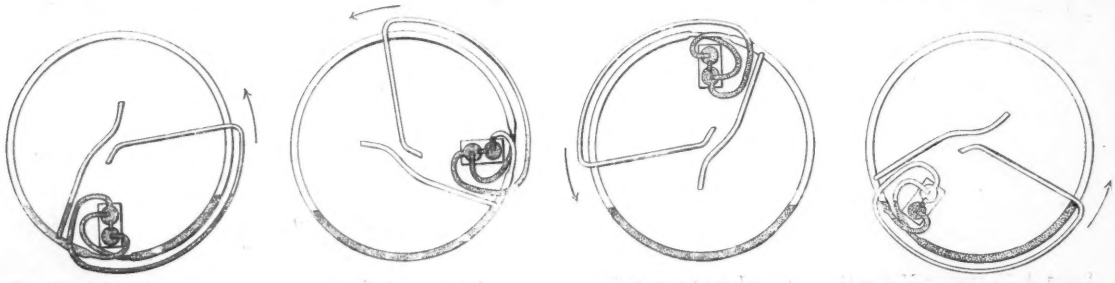
A common trouble with the high-vacuum pumps at present in use, is that due to a lamp breaking while being exhausted, a sudden inrush of air into the pump takes place, causing mercury hammer, which frequently breaks some portion of the pump, and necessitates that particular bench being shut down for more or less lengthy repairs.

With the Lowden pump nothing in the way of ordinary work can do any damage; the glass connections can be smashed while the pump is working at a high vacuum, and the mercury will simply oscillate violently in the annular tubes, but as soon as the glass work is repaired, the pump will recommence working in the usual way.

We understand that sets of 10 metal-filament 100-volt 32-C.P. lamps have been exhausted, without the aid of any chemical, in 15 minutes from start to finish, and that these lamps have now been running for over 600 hours without any diminution of brilliancy or cleanliness of bulb. We are indebted to Messrs. Mackie and Mr. Lowden for showing us the pump in operation, and demonstrating its action.

Flexible Towers for Transmission Lines.—It is interesting to note, in the *Electrical World* of January 20th, that American engineers are adopting the Semenza type of tower for transmission lines—that is, towers which are rigid transversely to the line, but flexible in the direction of the line. The construction is of steel channels, in the shape of a rectangular braced frame, of small dimensions at right angles to the plane of the frame, but otherwise very wide and stiff. These towers cost only half as much as towers of the windmill type. We regret to see that no credit is given to Mr. Semenza for the invention of this system, which has the advantage that in the event of a break in the line, the towers nearest the break bend sufficiently to relieve the line of the unbalanced stress.

Platinum.—An effort has been made in Russia to induce the government to buy up the yield of crude platinum in that country at a fixed price, refine the material in its own laboratories, and sell the platinum, dividing the profit amongst the producing mines. At a congress held at Ekaterinenburg to discuss the matter, out of 15 delegates only six voted for the arrangement, three against, and the rest did not vote. The Chicago *Mining World* points out, however, that the Ural companies "Compagnie Industrielle du Platine" and the "Petersburger Gesellschaft Platina" were not represented at the congress, and these companies produce together in their mines, on an average, half the Russian normal yield. Among the three voting against the arrangement were the Demidoff and Schuwaloff mines, two of the most important producers. The writer of the *Mining World* article (Mr. Grimshaw) does not anticipate that the Russian Government will adopt the arrangement, as being tied to a fixed price involves too much commercial risk.



Trap in lowest position. Suction tube unsealed. Trap in highest position. Trap approaching lowest position.

DIAGRAM SHOWING THE ACTION OF THE MERCURY IN THE LOWDEN PUMP AT FOUR SUCCESSIVE POSITIONS DURING ONE REVOLUTION.

NOTES.

(*Continued from page* 220.)

Dublin Electrical Contractors' Association.—The annual dinner of the Dublin Electrical Contractors' Association was held in Jury's Hotel on January 28th, Mr. C. Cummins presided, and amongst the guests were:—Sir Charles Cameron, Messrs. G. Murray Ross, H. J. Moore, A. E. Porte, M. Ruddle, F. Batchelor, E. Bradbury, H. T. Harris, J. F. Allen, L. J. Lawless, J. W. U. Sowter, T. Tomlinson, F. Roper, J. W. Boucher, S. Gentry, D. Mc. D. Grosart, J. Jones, G. Pilditch, P. Sheardown, S. Price, T. E. Brunker, C. H. Egan, S. P. Eaton II., J. Davidson, F. Barrett, J. C. Meldon, J. J. Simington, and others. After dinner the chairman proposed the toast of "The Institution of Electrical Engineers," and said the Institution had done much for the good of the profession, and was entitled to the support of the members of the profession. Mr. Ruddle, who responded on behalf of the Institution, said it had achieved a remarkable success, but there was a danger that it would content itself with its present comfortable position, and not do as much for the profession as it might. He mentioned recent fires in London and elsewhere, where the allegation was made that they were caused by faulty electrical fittings, as an illustration of the importance of having none but qualified electricians responsible for electrical installations. He hoped they would soon have an Irish Institution of Electrical Engineers, as it was not always satisfactory for them to be a branch of an English Institution. Mr. H. Tatlow also responded, and said that Dublin was the first large town in the United Kingdom to have a local section, and though the number of members was not large, still it had done good work, and had brought the members of the profession together. Mr. Lawless, responding to the toast of "Consulting Engineers," said his experience of the Dublin electrical contractors was that they were able to hold their own, and more, with the contractors of any other portion of the United Kingdom. In this matter the Irish electrical contractors stood an easy first, and he might add that the consulting engineers had always been treated with the strictest fairness by the Dublin contractors. The toast of "The Institution of Civil Engineers, the Royal Institute of Architects, and the Architectural Association of Ireland," was responded to by Messrs. Ross, Bradbury and Donnelly. Mr. A. E. Porte proposed the toast of the "Dublin Electrical Contractors' Association." The chairman, in responding, said one of the reasons why the Association was a small one, was that originally it was a branch of the London Association, but when they found that most of the money was going to England, the Irish members decided to start a branch of their own for the benefit of the Dublin contractors. Mr. Brunker, secretary of the Association, who also responded, said another reason why the membership of their Association was not larger, was that they wished to maintain the high status of the members, and not leave it open to everyone who would like to join. The toast of "Our Guests" was honoured, and responded to by Messrs. Simington, Allen and Tomlinson.

A New Use for Calcium Carbide.—Mr. E. Kilburn Scott described an interesting new application of calcium carbide, before a recent meeting of the Faraday Society—namely, a gas-pressure sprayer, the invention of Mr. W. Tyree, of Sydney. Although this sprayer was only introduced about five years ago, over 5,000 are now in use in Australasia. They are chiefly used for destroying all kinds of pests which run riot with fruit trees in Australia, but they are also put to such varied uses as spraying turpentine and zinc-white on the inside of feed tanks of boilers, for spraying disinfectants and for painting and distempering, and many other possible applications readily suggest themselves. The apparatus consists of two iron cylinders, in the larger of which is contained the spraying emulsion, while in the smaller the gas is made by water being allowed to drip at any required rate into the calcium carbide. The two cylinders are fastened together, and riveted to withstand a pressure of 200 lb. per sq. in., the acetylene being generated at half this pressure, which, by the way, exceeds that permitted by our Board of Trade Regulations. If only some material could be found which gives off a non-inflammable gas, the usefulness of the sprayer would be very greatly enhanced. It is worthy of note that the popularity of the sprayer in Australia has sent up the consumption of calcium carbide there from 2,000 tons four years ago (at £18 a ton) to over 8,000 tons (at £10 to £12 a ton) last year—actually more than is consumed in the United Kingdom, and an interesting proposition has been made to produce the carbide in Australia itself. According to the scheme suggested, 5,000 B.H.P. at 11,000 volts could be generated at the Barron Falls, in Queensland (a fall of 1,000 ft. head), and transmitted to a carbide factory at Cairns, on the seaboard, some 19 miles away, at a cost of £2 15s. per B.H.P.-year. The scheme is certainly one that will be watched with great interest.

The Single-Phase Series Motor.—At a meeting of the American Institute of Electrical Engineers held on January 14th, a paper entitled "The Space Economy of the Single-Phase Series Motor" was presented by Prof. W. S. Franklin and Mr. S. S. Seyfert. The authors state that the chief limitation encountered in the design of single-phase motors for heavy railway service is that of size; it is difficult to build a single-phase motor of sufficient horse-power rating in the limited space between the drivers on a locomotive. The authors suggest removing the commutator from the motor region, making the armature stationary, arranging the field structure to revolve, and placing the stationary commutator at some convenient point where revolving brushes may be positively driven by the revolving field structure. For this arrangement it is claimed that all the available space between the wheels will be occupied by active material which will be utilised to the best advantage. On account of the fact that in a single-phase series motor the armature should be magnetically stronger than the field, making the armature structure external to the field structure possesses over the usual arrangement the following advantages: (1) It presents more available space for the windings. (2) It makes possible a material shortening of the end-connections of the compensating windings without lengthening the end-connections of the armature windings. (3) It makes possible the removal of all non-sparking devices from the motor region proper, thereby relieving the designer of every limitation in the use of resistance leads or other non-sparking devices except the limitation of cost and weight; and (4) it makes possible the detaching of the commutator and the utilisation of the large amount of space ordinarily occupied by the commutator for motor iron and motor copper.

In commenting on the changed arrangement of the armature and field structures, the authors state that "what may at first sight appear to be a disadvantage in the detaching of the commutator is the necessity of driving the brush mechanism by gearing, but the transmission of the power required for this purpose does not present a serious problem; indeed, it would seem that the advantage of having the commutator and brushes always in view and always easily accessible would counter-balance any mechanical disadvantage involved in the detaching of the commutator."—*Electrical World.*

Very Slack!—The contractors for a country house installation sent in their little bill on completion, as is the pleasant custom. They were pained and surprised to get it back in due course, with a big red ink mark against the item of main cable—a matter of some 200 yd. of 37/14 lead-covered and armoured concentric. The blot on the fair face of the account was explained by the client's remark: "Surely a mistake somewhere?" followed by half a dozen exclamation marks.

The contractors turned up the invoice, and strong in the consciousness of virtue, replied as follows:—

"We must explain that where the cable trench is in loose, sandy soil, as in the present case, it is good practice not to stretch the cable taut from point to point, but to wave it from side to side of the trench, so as to allow plenty of slack in case of a subsidence of the ground. We think that you will find that this will account for any slight discrepancy between the length of cable charged for, and the distance between engine room switchboard and the main switch in house."

This crushing rejoinder having been dispatched, they sat complacently twirling their thumbs, and waited for the cheque. To their dismay, came back instead the following:—

"I am afraid your explanation, although satisfactory so far as it goes, hardly covers the difference actually existing. You have charged for 200 yd. of cable, whereas the actual distance, from switch to switch, is exactly 98 yd. Please look into the matter again and let me know the result."

This was awful! The air became thick with telegrams, telephones, letter-files, invoices and orders, not to mention naughty words. Half the staff had been sacked, and the other half were in tears, when the office boy, who had been sacked twice, suggested sending for the foreman. Then it all came out!

"Ye told me, sorr," said he, "not to have any cable left over at all. Ye didn't want it in stock. If there was a bit over I was to lave it in the ground. Bury it dacent. Ye said ye'd allowed some for slack. Sure, thinks I, there's a moighty bit of slack. But I'll be afther doing what I'm told. And I did. Ye'll find it in the trench."

True enough, when the trench was opened an odd 100 yds. of cable was found neatly coiled up in the middle of the run. The common mistake of confusing single and double run had been made by someone in the office, with the result that the intelligent foreman had had sufficient slack left to allow for an earthquake!

The Functions of the I.E.E.—The *Times* in its Engineering Supplement of Wednesday last publishes Mr. Garcke's letter on the functions of the Institution of Electrical Engineers. In its editorial comment on the subject our contemporary says:—"Without entering into the merits or demerits of the case, it may be remarked that the progress of an industry depends upon individual effort rather than upon common action by guilds and societies. There is a tendency to-day for individual members of engineering institutions to attribute their failures to laxity on the part of the governing bodies, and to devote time to criticism which could be better spent in the draughtsmen's office or in the estimating department of their own establishments. The council of an institution, after all, merely reflects the average opinion of the members, and while it can guide it cannot propel an industry towards success. A spoon-fed industry which shifts all its troubles to the back of its representative organisations is bound to be weakened."

Tramway Children's Treat.—On January 28th, the wives and children of the employés of the Reading Corporation Tramways, to the number of about 250, were given a substantial tea, followed by an entertainment in the Town Hall. An organ recital was given by Mr. Stuart Roseveare, A.M.I.E.E. (of the engineering staff of the Tramways Department), and most of the items on the programme were contributed by various members of the tramways staff. Ald. C. G. Field, J.P., chairman of the Tramways Committee, welcomed the children and their parents, and Mr.

W. Binns, the general manager, expressed his thanks to all those who had worked so hard in connection with the treat, and who had sacrificed not only their time, but, in many cases, their wages also in order to make the entertainment a success.

The Earth as the Return Circuit in Series Direct-Current Systems.—The Swiss Commission appointed to investigate this question has recently issued its preliminary report, from which we take the following particulars:—After some introductory tests, the permission of the Lausanne Corporation to run with the earth as the return circuit on the Saint Maurice-Lausanne line was readily obtained, but the railway telegraph authorities noticed disturbances in certain of their lines, and so refused permission at first. The difficulty was, however, got over in 1908 by the simple device of inserting a few opposing cells in the telegraph lines affected, and so neutralising the action of the drop in the (constant current) earth return. The arrangement proved so effective that the desired permission was then obtained, and after the necessary batteries had been installed at four of the stations along the line the earth return service was adopted, and has been in regular use from August, 1908, up to the present time without any interruption. The return circuit can be changed over from "earth" to "line" (a second wire being available) at any time if desired in three or four minutes. The Commission has now concluded its investigations, and the detailed results as to the best arrangement of the earth connections, the equivalent resistance of the earth return, &c., will be published shortly.—*L'Industrie Electrique*, January 25th, 1910.

Cheap Electric Light.—A correspondent writes:—"The following cutting from the correspondence columns of the current number of *English Mechanic* may interest your readers:—

"'I have installed the electric light in my house. I have a petrol motor, very economical, and available for lathe work, dynamo 250 watts, compound and shunt at will, direct lighting, and also for charging set of 13 accumulators; completely fitted enamelled switchboard, with all usual instruments. I have fitted all myself, including wiring of switchboard and house. Necessary fuses are inserted at proper points, ensuring safety, together with high-grade 800-megohm cables, and best branch and flex. wires. I have 30 lamps, each of 10-C.P. direct lighting, and 15 lamps, if I wish, every night for six hours. I charge practically only three times a week. The whole outfit cost me just under £24, and is of the best and most satisfactory.'

"Who says that England is not waking up?—ENVIOUS."

The B.A. Meeting, 1910.—The annual meeting of the British Association opens at Sheffield on August 31st, with the presidential address of Prof. T. G. Bonney. The Engineering Section will be presided over by Prof. W. E. Dalby. Mr. E. W. Hobson, Sc.D., F.R.S., will be the chairman of the Mathematical and Physical Science Section.

Electro-Harmonic Society.—The next concert of this Society will be held in the King's Hall, Holborn Restaurant, on Tuesday evening, February 15th, commencing at 8 o'clock. It will be a Ladies' Night. The artistes are to be Miss Mabel Manson, Miss Zelie Delsart, and Mr. Ivor Foster; Miss Clara Hubbard, recitations; Mr. Percy French, artistic sketches; Mr. Astley Weaver, humorous sketches; Mr. Laurie Wylie, the mimicking manikin; and a complete orchestra.

Institution and Lecture Notes.—SOCIETY OF ENGINEERS.—The first ordinary meeting of the new society formed by the amalgamation of the Society of Engineers and the Civil and Mechanical Engineers' Society was held on Monday, when Mr. D. A. Symons, the first president of the new society, delivered his inaugural address. He stated that since the amalgamation there were more than 700 members.

INSTITUTION OF MUNICIPAL ENGINEERS.—At a meeting of the Council on January 26th, seven applicants were elected to membership. The roll of the Institution now stands at 686 members and 96 students, making a total of 782. The report of the Committee appointed to draw up regulations for District Committees was presented, and the draft regulations were approved. There will be a general meeting of the Institution in the Western District during the month of March.

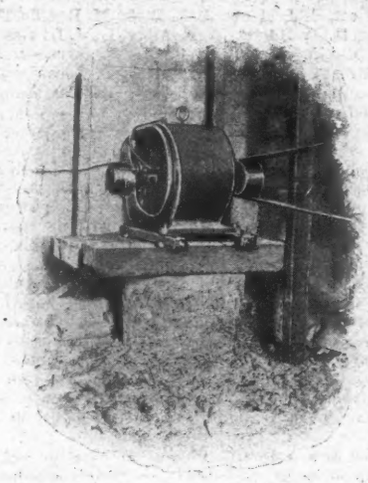
At the meeting of the London Association of Foreman Engineers and Draughtsmen, held at Cannon Street Hotel on Saturday last, Mr. W. J. Goudie, B.Sc., A.M.I.Mech.E., read a paper illustrated by lantern slides entitled "The Evolution of the Flying Machine," a historical review from 1500 to 1909. At the meeting to be held on March 5th, Mr. L. Andrews, M.I.E.E., A.M.Inst.C.E., will read a paper upon "The Running of Large Gas Engines."

Detonation.—At Selnitz, Bitin, a rock-blasting operation on a large scale was recently undertaken, in which for the first time the detonation of the explosives was effected by means of the wireless system. The operator was about 550 yd. from the actual situation of the rocks to be blasted. The electric waves (with the assistance of a local circuit) made a small plate of platinum incandescent, and this lighted the fuse. The blasting-chamber contained about 660 lb. of dynamite, and more than 11,000 cb. yd. of rock were successfully blasted.

Annual Dinner.—The annual dinner of the Central Technical College Old Students' Association will take place at the Trocadero Restaurant, Piccadilly, to-morrow, Saturday (12th inst.), at 7.30 p.m. Among the guests will be Mr. W. H. Allen, of Bedford, and Mr. A. L. C. Fell, of the L.C.C. tramway department.

Appointment Vacant.—Mechanic for the Science Laboratories at University College of North Wales. See our advertisement pages for particulars.

Electrical Engineering in the Backwoods.—We have received from Mr. E. C. Barton, of Brisbane, a photograph, which we reproduce herewith, showing a remarkable specimen of



foundation work which he unearthed in a "back-blocks" hotel. The dynamo, which is driven by an oil engine, supplies electric light for the hotel and two shops. We should think the foundation block is unique.

Indian Notes.—Our correspondent writes:—"The Eastern Bengal State Railway requires the services of an electrical engineer at 500 rupees a month. He must be under 35 years old, an Associate Member of the I.E.E., with A.C. and D.C. experience. This is a good opportunity for a sound, healthy man on the look-out for a 'steady job,' with plenty of work. The salary offered is equal to a little over £33 monthly; probably, although it is not stated, the usual Government leave regulations will obtain. There will be many local applications, but a home man is usually preferred. Applications should be sent, with testimonials and fullest information of past record, to the Manager, E.B.S. Railway, Sealdah, Calcutta.

"*Calcutta Port Trust.*—Large electrical extensions are being carried out departmentally by the Trust engineers. Their very fine generating station at Kidderpore, equipped a few years ago by the Westinghouse Co., is a good example of modern installation work, and the arc lighting of the docks, jetties and wharves is, perhaps, second to none out East. There are over 200 flame arcs on circuit, necessitating an annual carbon supply of 80,000 pairs alone. The yearly competition for this carbon contract is very keen indeed, and prices are so cut as to make it scarcely worth having on its own merits. Contractors, however, are very keen on keeping in touch with the Trust authorities, as there are many small pickings to be had during the year, which are not put out to tender.

"*Allahabad Exhibition*, 1910.—It is excusable to revert to this proposed undertaking again on account of its general importance and the thoroughness with which it is being planned in every detail. English manufacturers of electrical machinery, pumps, oil engines and kindred apparatus would be well advised to interest themselves in it, and arrange through their local Indian agents for exhibits of their specialities. Cheap oil engines and centrifugal pumps for irrigation purposes are much sought after, as are also handy and simple generating electric sets for club and bungalow lighting and fan installations of small sizes for up country. The prospectus is already published, and may be had from the secretary.

"The following is an incomplete list of electric work either in hand or about to be shortly commenced by various home contractors or their Indian agents:—

"Gwalior-Morar town lighting extensions; Messrs. Siemens Bros.

"Chamba Valley hydro-electric installation; Messrs. Crompton and Co.

"Patiala city lighting; Messrs. Siemens Bros.

"Simla hydro-electric; contract not yet decided.

"Mawbang hydro-electric; concession granted to British Westinghouse Co.

"Tata Steel Works, Central India; Lahmeyer & Co.

"Bhopal city lighting; General Electric Co.'s agents.

Gas and Electricity Supply.—A development of its subsidiary branch of gas supply is contemplated by the Rhenish-Westphalian Electricity Works Co., which was formed several years ago for the provision of light and power over as large a portion of this district as possible, and which furnished from its various stations 56,000,000 KW.-hours in 1908-9. The company has an ordinary share capital of £1,500,000, in addition to bond capital amounting to £1,500,000, and it has secured the co-operation of several local authorities to the extent of their having subscribed

£475,000 out of the former capital. Three gasworks on a small scale were acquired by the company a few years ago at Borbeck, Mettmann and Rotthausen respectively, and it is now intended to endeavour to considerably develop this branch by the inclusion of a number of other gasworks, and by the utilisation of the surplus gases from coke-making works. The scheme will probably form the subject of a separate company, in which various towns will also be financially interested, and negotiations on the matter have already been partly concluded and are partly in progress. The districts to be first brought within the scope of the undertaking will be Barmen, Elberfeld, Recklinghausen and Essen, and it is expected that the enterprise will eventually be extended beyond the limits of Rhenish-Westphalia.

OUR PERSONAL COLUMN.

The Editors invite electrical engineers, whether connected with the technical or the commercial side of the profession and industry, also electric tramway and railway officials, to keep readers of the Electrical Review *posted as to their movements.*

Central Station Officials.—The Hackney Electricity Committee recently considered an application from Mr. L. L. Robinson, the electrical engineer, for an increase of salary. Mr. Robinson was appointed in 1901 at a commencing salary of £400 per annum, and a maximum of £750 was shortly afterwards fixed with annual increments of £25. The salary at present received by Mr. Robinson is £550 per annum. At the time the Council fixed this salary they had the services of Mr. Hammond as consulting engineer, but this work has been undertaken by Mr. Robinson for several years, and, in addition, extra work is involved in connection with the development department established nearly two years ago. In view of all the circumstances, and having regard to the salary paid in connection with similar undertakings in and near London, the Committee have decided in favour of granting Mr. Robinson an increase of £50 instead of £25 in his salary as from April 1st, 1910, and that the future annual increments be £50 until the maximum of £750 already fixed by the Council has been reached.

Mr. A. A. Day, the borough electrical engineer and general manager of the Bolton Corporation Tramways, met with a serious accident on Saturday night, through being knocked down by a tramcar. Mr. Day had only just left the tramways offices in Bradshawgate, and was about to enter a Chorley New Road car, to go to his home, when he was knocked down by a Farnworth car. Fortunately, he was not run over, but was injured about the head, and was taken to the infirmary in an unconscious condition. Subsequently he was taken to his home in Chorley New Road.

Mr. Albert E. Squires, of the Northern Counties Electricity Supply Co., Ltd., has been appointed resident engineer at their station at Malton, Yorks., vice Mr. Joseph Chandler, who has resigned and been appointed resident engineer at Hexham by the Hexham and District Electric Supply Co., Ltd.

The Bootle T.C. has granted an honorarium of £50 to Mr. T. D. Clothier, electrical engineer, in view of the satisfactory condition of the undertaking and of the fact that additional responsibility will devolve upon him in connection with extensions.

The Gillingham (Kent) T.C. has decided to pay the electrical engineer a salary of £300 per annum, plus 1 per cent. on the gross profits, on a three years' agreement, which that official has accepted. The Council has also passed a vote of confidence in the electrical engineer. The salary has been £350 per annum.

Tramway Officials.—Mr. William B. Lait has been appointed works superintendent to the Birmingham and Midland Tramways Joint Committee at their Tividale Car Works, having held a similar position with the Bournemouth Corporation to the end of 1909.

Hull T.C. has been recommended to increase the salary of Mr. W. T. Robson, tramway rolling stock assistant, by £25 a year.

General.—We understand that Sir Clifton Robinson left London on Tuesday, in connection with his foreign enterprise alluded to by us last week.

On leaving Sketty, Swansea, to take up a position in the Midlands, Mr. J. Smallwood, electrical engineer, has received from a number of friends, a gold watch, which was presented to him at a complimentary banquet on Friday.

Mr. Wm. Wilson Rae, general manager of the firm of Fred. Wilkins & Brother, Ltd., of Liverpool, asks us to state that he has never had any connection whatever with the person passing under that name in our "Bankruptcy Proceedings" note of last week.

The Telephone Committee of Hull T.C. has recommended that the salary of Mr. Holmes, telephone manager, be increased by £25 by two annual increments of £12 10s.

The marriage took place on February 3rd at Halifax of Mr. Horatio Stead, electrical engineer, Halifax, and Miss Clara Crabtree, elder daughter of Mr. W. Crabtree, J.P., of Halifax.

Obituary.—Mr. T. Maclagan.—The death has occurred of Mr. T. Maclagan, chief superintendent of the postal telegraphs at Manchester.

NEW COMPANIES REGISTERED.

Rural Electricity Supply Co., Ltd. (107,281).—This company was registered on February 2nd, with a capital of £10,000 in 9,500 participating preference shares of £1 each, and 10,000 deferred shares of 1s. each, to carry on the business of electricians, engineers, producers and suppliers of electricity, motive power and light, &c. The subscribers are:—B. P. Gibbons, Dingley, Tilehurst, Berks., company director, 250 deferred shares; G. B. Crockatt, The Knoll, Kidmore Road, Caversham, electrical engineer, 250 deferred shares; H. T. Harrison, 11, Victoria Street, S.W., engineer, 250 deferred shares; S. I. Pettit, Hurley, West Tarring, Sussex, engineer, 250 deferred shares; J. D. Dymond, 16, Davies Street, W., engineer, 1 deferred share; E. S. New, 11, Victoria Street, S.W., engineer, 1 deferred share; H. Dixon, 11, Victoria Street, S.W., secretary, 1 deferred share. Minimum cash subscription 2,000 participating preferred shares. The number of directors is not to be less than three or more than 10; the first are B. P. Gibbons, G. B. Crockatt, and H. T. Harrison; qualification, 100 shares (either class); remuneration, one guinea each per meeting attended. Registered office, 11, Victoria Street, S.W.

Star Electric Light Co., Ltd. (107,170).—This company was registered on January 25th, with a capital of £1,000 in £1 shares, to carry on the business of electrical engineers and contractors, electricians, suppliers of electricity, &c., to acquire the business carried on at 6, St. Swithin's Lane, E.C., as the Star Electric Light Co., and to adopt an agreement with J. A. Rummens. The subscribers (with 10 shares each) are:—J. A. Rummens, 6, St. Swithin's Lane, E.C., electrical engineer; A. J. Barnett, 46, Castlewood Road, Clapton, N., managing clerk. Private company. The number of directors is not to be less than two or more than seven: the first are J. A. Rummens (chairman and managing director), A. J. Barnett and E. G. Waxham; qualification, 10 shares; remuneration of chairman and managing director £75 per annum: of other directors £25 per annum. Registered by Hatchett-Jones, Bisgood and Marshall, St. Lawrence House, 48, Mark Lane, E.C.

Trackless Trolley, Ltd. (107,210).—This company was registered on January 28th, with a capital of £100 in £1 shares, to acquire any patents and inventions relating to any trackless trolley system, whether Stoll's system or otherwise, and to carry on the business of manufacturers of and dealers in materials for making and equipping trackless trolleys, tramways, light railways, omnibuses and other vehicles, &c. The subscribers (with one share each) are:—G. F. Underwood, 14 and 15, Cockspur Street, S.W., director; C. P. Wenzel, 14 and 15, Cockspur Street, S.W., civil engineer. Private company. Table "A" mainly applies. Registered office, 15-16, Cockspur Street, S.W.

Vera Cruz Telephone Construction Syndicate, Ltd. (107,144).—This company was registered on January 25th, with a capital of £10,000 in £1 shares, to carry on the business of a telephone, telegraph and electric light, heat and power supply company, and to adopt agreements (1) with J. Sitzenstatter and another; (2) with W. T. Henley's Telegraph Works Co., Ltd.; (3) with the said J. Sitzenstatter, and (4) with R. B. Bumeller. The subscribers (with one share each) are:—W. J. Simpson, 35, King's Road, Willesden Green, N.W., clerk; A. H. Conybeare, 13, Alverstone Avenue, Wimbledon Park, S.W., clerk. Private company. Table "A" mainly applies. Registered by Linklater and Co., 2, Bond Court, E.C.

Electric Timekeepers, Ltd. (107,214).—This company was registered on January 29th, with a capital of £1,000 in £1 shares (300 20 per cent. cumulative preference), to take over certain inventions relating to the manufacture of electric clocks, chronometers, timepieces or watches, and to adopt an agreement with C. Haunz. The subscribers (with one preferred share each) are:—H. T. Holmes, 166, Wilmot Street, Bethnal Green, N.E., cashier; F. H. Law, 7, Princes Square, Kennington Park Road, S.E., clerk. Private company. The number of directors is not to be less than two or more than six the first are not named; remuneration, 10 per cent. of the net profits after 1s. per share has been paid on the issued ordinary shares. Registered by Christopher & Son, 5, Argyll Place, W.

Ellis & Ward, Ltd. (107,215).—This company was registered on January 29th, with a capital of £10,000 in £1 shares, to take over the business of an electrical engineer and contractor carried on by H. W. Ellis at Edmund Street, Birmingham, as "Ellis & Ward." The subscribers (with one share each) are:—H. W. Ellis, Holly Hill, Berkswell, Warwickshire, electrician; B. Davies, Farquhar House, Richmond Hill, Edgbaston, electrician; A. Edwards, 90, New Street, Birmingham, chartered accountant. Private company. The number of directors is not to be less than two or more than five; the first are H. W. Ellis and B. Davies, joint managing directors; qualification, 100 shares; remuneration of joint managing directors, £250 each per annum. Registered by Jordan & Sons, Ltd., 116 and 117, Chancery Lane, W.C.

Underhill & Ritchie, Ltd. (7,430).—This company was registered in Edinburgh on February 1st, with a capital of £5,000 in £1 shares, to carry on business as electrical, consulting and general engineers and contractors, makers of motors, machinery, goods, apparatus and fittings, &c. The subscribers (with one share each) are:—W. R. Underhill, 79, Bath Street, Glasgow, electrical engineer; W. A. Ritchie, 51, Montgomerie Street, Glasgow, electrical engineer. Private company. The number of directors is not to be more than four; the first are W. R. Underhill and W. A. Ritchie; qualification, £1; remuneration as fixed at general meeting. Registered office, 79, Bath Street, Glasgow.

Traffic Indicators, Ltd. (107,237).—This company was registered on January 31st, with a capital of £5,000 in £1 shares, to carry on the business of manufacturers of and dealers in indicating instruments and recording devices, electricians, electrical engineers, generators and storers of electricity, &c., and to adopt an agreement with H. A. Lamb and C. O'Neill Crowley. The subscribers (with one share each) are:—J. T. Bottomley, 18, University Gardens, Glasgow, consulting engineer; C. O'Neil Crowley, 4, Carlton Road, N., director. Private company. The first directors are J. T. Bottomley and C. O'Neil Crowley; qualification, £50; remuneration as fixed by the company. Registered office, 385, City Road, E.C.

OFFICIAL RETURNS OF ELECTRICAL COMPANIES.

A. W. Penrose & Co., Ltd.—A memorandum of satisfaction to the extent of £1,200 on November 16th, 1909, of debentures dated October 27th, 1905, securing £10,000, has been filed.

Liverpool Electric Cable Co., Ltd. (71,099).—A memorandum of satisfaction to the extent of £4,000 (balance outstanding) by instalments from April 26th, 1908, to November 9th, 1909, of debenture dated December 9th, 1904, securing not more than £6,000. (The actual amount never exceeded £4,600.)

Penarth Electric Lighting Co., Ltd. (52,912).—Trust deed dated December 22th, 1909, covering debenture stock to secure not more than half the nominal capital, charged on the company's undertaking and property, present and future. Holders: British Electrical Federation, Ltd., Kingsway, W.C.

Collieries Electric Power Development Syndicate, Ltd. (90,729).—This company's annual return was filed on January 22nd, when 6,001 shares had been taken up out of a nominal capital of £10,000 in £1 shares; 15s. per share has been called up on 4,000 shares, resulting in the receipt of £2,875; £125 remains in arrears; £2,000 is considered as paid on 2,000 shares (remaining 7 shares unaccounted for). Mortgages and charges: Nil.

Robinson & Hands Electrical Co., Ltd. (100,349).—Particulars of £300 debentures created January 4th, 1910, filed pursuant to Sec. 93 (3) of the Companies' (Consolidation) Act, 1908, the whole amount being now issued. Property charged: The company's undertaking and property. No trustees.

Hindhead and District Electric Light Co., Ltd. (75,361).—Issue on December 20th of £500 and on January 22nd of £800 debentures, part of a series of which particulars have already been filed.

British Tramways and General Construction Co., Ltd. (78,034).—This company's annual return, made up to December 29th, has been filed. 241,000 shares have been taken up out of a nominal capital of £300,000 in £1 shares. £241,000 has been received. Mortgages and charges: Nil.

Blackpool and Garstang Electric Light Railway Co., Ltd. (62,150).—This company's annual return was filed on January 1st, when 861 shares had been taken up out of a nominal capital of £10,000 in £5 shares. £4 per share has been called up, resulting in the receipt of £1,707 (including £323 paid in advance). £60 remains in arrears. Mortgages and charges: Nil.

Walsall Electrical Co., Ltd. (37,696).—This company's annual return, made up to November 23rd, has been filed. 12,000 shares have been taken up out of a nominal capital of £20,620 in £1 shares. £10,000 has been received and £2,000 is considered as paid. Mortgages and charges: Nil.

New Phonopore Telephone, Ltd. (44,654).—This company's annual return was filed on November 17th, when 6,741 ordinary and 1,000 founders' shares had been taken up out of a nominal capital of £10,000 in £1 shares (8,000 ordinary and 1,000 founders'). £1 per share has been called up on 6,741 ordinary, and £6,731 has been received. £10 remains in arrears. £1,000 is considered as paid on the founders'. Mortgages and charges: £2,200.

Venezuela Telephone and Electrical Appliances Co., Ltd. (31,305).—This company's annual return, made up to November 23rd, 1909, has been filed. 70,000 ordinary and 860 preferred shares have been taken up out of a nominal capital of £85,000 in 70,000 ordinary shares of £1 each and 1,500 preferred shares of £10 each. £1 per share has been called up on 13,494 ordinary and £10 per share on 860 preferred shares, resulting in the receipt of £22,094. £56,506 is considered as paid on 56,506 ordinary. Mortgages and charges: £120,000.

East India Tramways Co., Ltd. (74,457).—This company's annual return was filed on December 16th, when 7,476 preferred, 33,433 ordinary and 30,000 deferred shares had been taken up out of a nominal capital of £80,000 in £1 shares (15,000 preferred, 35,000 ordinary and 30,000 deferred). 15s. per share has been called up on 7,476 preferred and £1 per share on 7 ordinary shares, resulting in the receipt of £5,614. £63,426 is considered as paid on 33,426 ordinary and 30,000 deferred. Mortgages and charges: Nil.

Cape Electric Tramways, Ltd. (54,636).—This company's annual return was filed on December 10th, when 491,222 shares had been taken up out of a nominal capital of £500,000 in £1 shares; £91,222 has been received, and £400,000 is considered as paid. Mortgages and charges: £524,300.

Douglas Southern Electric Tramways, Ltd. (45,701).—This company's annual return was filed on January 19th, when 25,978 preference and 15,472 ordinary shares had been taken up out of a nominal capital of £50,000 in 30,000 preference and 20,000 ordinary shares of £1 each; £1 per share has been called up on 12,566 preference and 5,804 ordinary shares, resulting in the receipt of £18,370; £23,075 is considered as paid on 13,407 preference and 9,668 ordinary. Mortgages and charges: Nil.

CITY NOTES.

Great Northern and City Railway Co.

The Earl of Lauderdale presided last Friday at the half-yearly meeting held at Westminster Palace Hotel. In moving the adoption of the report, he said that the revenue account showed a deficit of £5,709, which had been balanced by a special receipt of a similar sum from friends of the railway, who had come to the rescue in order that the fixed charges might be met. They had added £311 to the receipts and saved £1,209 in expenses. The serious and continuous decline of passengers which commenced in December, 1907, had now been arrested, and for the last half of 1909 there was an increase of 117,059 passengers as compared to the same half of 1908. The working expenses were 54·34 per cent. of the total revenue, against 56·18. They had to some extent counteracted the severe tram competition on Sundays by giving an earlier train service to the public. The car-miles had been reduced by 46,502, whilst the train-miles had increased by 8,777, which was satisfactory as indicating that notwithstanding the reduction in car-miles there was an improvement in the train service. While the statement he had submitted could not be considered a satisfactory one, it contained, at any rate, some encouraging items. The directors saw no reason why they should not eventually return to the figure of 16 million passengers, which they attained in 1906. The economical methods which obtained on the line as the result of a careful consideration of every item of expenditure since the line was opened, would in that event enable them to meet their fixed charges without assistance and leave a surplus over. The shortness of the line would always militate against short-distance passengers to intermediate stations, but the line continued to be the most rapid means of communication amongst the many which existed between Finsbury Park and the City, and, having regard to the strip tickets they had introduced, it should become the most popular route for regular traffic. During the past half-year negotiations were opened with the Great Northern Railway with reference to the through running of trains from their system to the Moorgate Station of the Great Northern and City Railway, and one of the trains of the latter company was experimentally run on the Great Northern line. The terms from which the Great Northern Railway approached the discussion of the matter were not sufficiently in this company's interests to justify the directors in going further into the business for the present. The board felt that the future of the line depended largely on its being used as the City terminus of the Great Northern system. The Great Northern Railway itself had no separate access into the City.

The report was adopted, and a special general meeting followed, at which the Bill providing for the construction of an underground passage at Moorgate Station was approved.

Anglo-American Telegraph Co., Ltd.

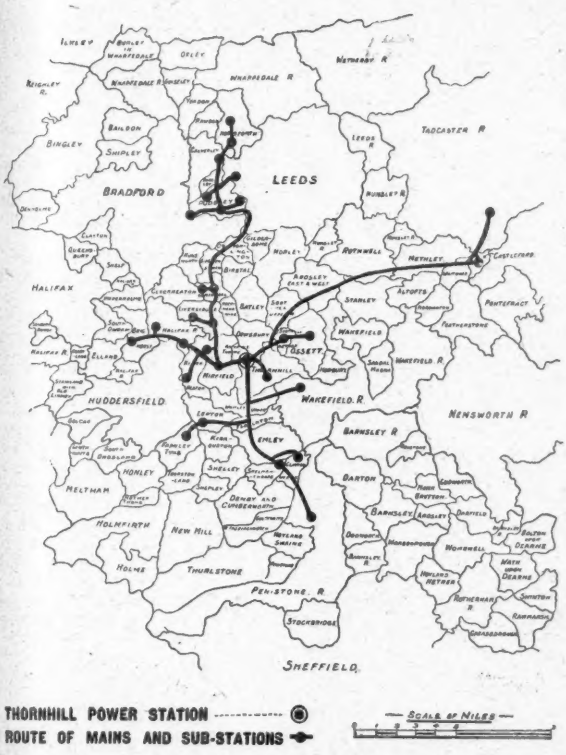
Mr. F. A. Bevan presided at the meeting, held at Winchester House, E.C., last Friday, and congratulated the shareholders upon a better year. The receipts had increased by £12,627, and, with the larger carry forward, there was an advance of £30,078 as compared to the previous year. According to a report in the financial papers, the chairman said that a good deal of the increase in the receipts doubtless arose from stock traffic, of which they had obtained a larger proportion than formerly on account of their quicker transmission. The total gross pool receipts for the year were £678,110, or within £100 of those of 1906. In that year the dividend on the ordinary stock was £3 17s. 6d. per cent., against the £3 12s. 6d. per cent. now proposed. The explanation was that in 1906 nothing was added to the renewal fund, which then exceeded the £1,000,000 agreed upon between the board and the proprietors as a total which need not be augmented; whereas in 1909 £20,000 was added thereto, which, with interest on the fund, was not quite equal to the sum spent on repairing the 1874 cable. The effect was that at the end of the year the renewal fund was £2,694 less than at the beginning. At the previous meeting, speaking of the repair of the 1874 cable, he had said that a little over £15,000 had been spent, and that the board hoped it would not be necessary to spend much more. Altogether, however, this work had cost over £53,000. It was a large sum, but the weather had been very bad, and, fishing for the cable in two miles of water, they had failed again and again to take it up. At length they were successful, and the cable was now working as efficiently as ever. During the year the 1873 cable also had been repaired, but in this case they were more fortunate. Whereas the repair of the 1874 cable required 246 miles of new cable, the 1873 took only 11 miles. The strength of the cable had deteriorated through age, and, working in water two miles deep, it was found impossible to recover the end of the 1874 cable until a gap of 246 miles had been made. In addition to the actual cost of repairs, consideration should also be given to the time the cables were out of service. In the case of the 1873 cable, it was out of operation for only 30 days, but the 1874 cable was not available for over 10 months. This exemplified the risks of cable business. Other companies probably had had much the same experiences. They heard of new cables to be laid, but he wondered whether those who talked so readily about them considered the cost of maintenance, and especially the cost of making good these breakages, which had arisen more frequently of late, on account of the work of trawlers. So many repairs had been rendered necessary to the company's cables off the Irish Coast that in 1906 the board decided to renew all the older cables in the locality, and in that year 80 miles of new cable were inserted in the 1873 line, cutting out 12 previous repairs, and in 1907 61 miles were inserted in the 1874 cable, cutting out nine previous repairs, and 58 miles in the 1880 cable, cutting out seven previous repairs. If it had not been for the trawlers, probably none of these interruptions would have occurred. The matter of the trawlers was therefore most serious. At the last meeting he told the shareholders that a conference had taken place between the Board of Trade, the Admiralty, the Fishery Board and the Post Office, and a commission appointed to inquire into the matter. At the inquiry the company proposed that trawlers should not be permitted to fish in the shallow waters off the Irish Coast. The committee, however, had not seen their way to agree to this suggestion, and so the breaks in the cables continued. The directors were still in communication with the Fishery Board on the matter, and a suggestion had been made that an alteration in the form of trawl might prevent the damage. It was sincerely hoped that the matter would be taken up, because, however strong the cables might be made, no cable that could be invented would withstand the attacks of these great trawlers, with their powerful machinery, going to the depths their trawls now attained. They were told that there was going to be an improvement in trade, and he hoped it might so prove, for, if it did, the company no doubt would profit by it.

The report was adopted.

Bruce Peebles & Co., Ltd.—The first annual report of this reconstructed company has been issued. It will be submitted at the meeting to be held at Edinburgh on Friday, February 18th. It is stated that the trading for the period from December 5th, 1908, to December 31st, 1909, after deducting maintenance, general charges and expenses of administration, shows a loss of £5,683, to which has to be added the interest on the first and second debentures, less interest received, increasing the balance to £12,981.

Yorkshire Electric Power Co.

The directors' report for the 12 months ending December 31st, 1909, to be presented at the meeting at Leeds on February 15th, shows that the receipts from the sale of energy and for work charged out to consumers, &c., amount to £25,763, against £18,643 for 1908, and £11,994 for 1907. The gross profit on the revenue account is £6,087 for 1909, against a gross profit of £2,819 for 1908, and £433 for 1907. After payment of mortgage interest the net revenue account shows a profit on 1909 of £2,664, against £718 for 1908, and for 1907 a loss of £1,350. The net profit of £2,664, with £718 brought forward from 1908, makes a total disposable balance of £3,382, and the directors recommend that this amount should be carried forward. A call of 5s. in the £ has been made on those holders of second mortgages in the undertaking of the company who have not already paid in full. Owing to demands from large users of power an overhead main is being carried through Soothill Nether, Soothill Upper, East and West Ardsley, Stanley, Whitwood, Methley, Rothwell, and Castleford to Allerton Bywater; this will be completed and begin to bring in revenue in the course of the next few weeks. In addition to a steady growth of the number of connections to the mains of the company, there have, as in previous years, been continuous extensions of the use of electric power by existing customers—a most satisfactory evidence of their appreciation of the company's supply. In consequence of these extensions, and in view of further negotiations now in progress, the directors have considered it necessary to



place on order a fourth turbine of the same type but of double the capacity of the present ones, together with an additional boiler. These will be erected during the present year in the space provided in the existing buildings. As further capital will be required for these extensions, and to cope with the continuous progress of the company, it is proposed that powers shall be obtained to issue as preference shares a portion of the unissued shares of the company. This requires the authority of Parliament, and a Bill has been prepared and will be submitted to the shareholders at a special meeting to be called at the conclusion of the shareholders' meeting. The clauses asked for are non-contentious, are almost entirely confined to the internal finance of the company, and afford no ground for opposition by any of the authorities in the company's area. As already reported in September last, Mr. Walter Geoffrey Jackson, chairman of Henry Briggs, Son & Co., Ltd., has accepted a seat on the board. The directors report the resignation, in consequence of his departure for the United States, of Mr. E. A. Carolan, who has been on the board since the inception of the company. Mr. H. C. Levis, managing director of the British Thomson-Houston Co., Ltd., has consented to fill the vacancy thus created.

Prospectus.—*Central Sumatra Rubber Estates, Ltd.*—This company is offering until to-day 108,750 shares of £1 each.

Bank Rate.—The Bank Rate was yesterday reduced from 3½ to 3 per cent.

Bristol Tramways and Carriage Co., Ltd.

The directors' report for the year ending December 31st, 1909, states that the gross receipts were £285,564, and the ordinary working expenses £199,372. The directors propose appropriations as hereafter detailed for interest and dividends amounting to £68,114, the remainder of the available revenue, £18,079, having been allocated towards the year's outlay upon reconstruction of permanent way in addition to the ordinary repairs and maintenance. This outlay of £21,301 compares with £9,877 under the same head in the preceding year. Interest for the year on 4 per cent. mortgage debenture stock, 4½ per cent. mortgage debenture stock and on deposits and bankers' interest £20,926, dividends on 4 per cent. preference shares for the year (subject to income-tax) £18,875, interim dividend at the rate of 6 per cent. per annum (subject to income-tax) for the half-year ending June 30th £14,187, proposed final dividend at the rate of 6 per cent. per annum (subject to income-tax) for the half-year ending December 31st £14,125. The interest on investments having been carried direct to the credit of the reserve fund, and the value of the securities adjusted to market prices at December 31st, the totals of the reserve fund and of the investments representing it both amount to £200,833. The receipts of the carriage department show an increase of £22,204, and those of the tramways department a decrease of £2,056. The total number of passengers carried during the year on the company's cars and omnibuses was 45,839,738, as compared with 46,652,339 the previous year, a decrease of 812,651. The traffic on the new Westbury extension is included in this year's figures, or the disparity would have been even larger, as the city routes without exception showed decreases, notwithstanding that every effort was made to attract traffic by maintaining the same frequent services as in previous years. The company's motor-cab business is being carefully developed in Bristol and Bath, and the directors contemplate its further extension. One hundred and twenty cabs have already been put into service, and 50 more will shortly be added.

Central Electric Supply Co., Ltd.—The directors' report for 1909 states that energy has been supplied to the Westminster and St. James' Companies throughout the year, to an amount of 17,282,370 units. After making a full allowance for sinking fund and depreciation, the net balance for the year 1909 is £5,013 + £23 brought forward, leaving to be dealt with £5,036. The directors propose a dividend at the rate of 5 per cent. on the ordinary shares for the year, £5,000, carrying forward £36. The extension of the buildings and plant of the Grove Road works has been completed, and they now have an effective capacity of 12,830 kw.

Hungary.—The balance-sheet of the Ungarische Electrizitäts Gesellschaft, of Buda-Pesth, for the last financial year, shows a net profit of 1,611,627 crowns, as contrasted with 1,578,816 crowns in the preceding 12 months. The dividend is being increased from 9 to 11 per cent.

Rees Roturbo Development Syndicate, Ltd.—The report for 1909 shows a net profit of £2,424, and adding £1,095 brought forward, the amount available for distribution is £3,520. The directors recommend a final dividend for the six months ended December 31st at the rate of 6 per cent. per annum, making, with the interim dividend, 5½ per cent. for the year, carrying forward £1,963.

Chelsea Electricity Supply Co., Ltd.—The directors recommend a dividend for the half-year to December 31st, 1909, at the rate of 5 per cent. per annum on the ordinary share capital of the company, making 4½ per cent. for the year 1909, after paying debenture interest and placing £12,530 to depreciation fund, £704 to debenture premium redemption fund and writing off £1,089 from the cost of extinction of founders' shares, carrying forward £1,362 as against £1,024 in the previous year. The ordinary dividend for 1908 was at the same rate. The dividend will be payable on and after March 15th, 1910.

British Aluminium Co., Ltd.—Meetings of share and debenture stockholders are shortly to be held to consider a reconstruction scheme drawn up by the receiver and manager. It is proposed to form a new company with larger capital powers to take over the assets and liabilities. There are indications of greatly expanding business. The authorised share and debenture capital of the new company will be £2,750,000.

South Metropolitan Electric Light and Power Co., Ltd.—The transfer books and register of members will be closed from February 15th to 28th for the preparation of dividend warrants payable 28th inst.

Telegraph Construction and Maintenance Co., Ltd.—The directors have declared a dividend of £1 4s. per share, together with a bonus of 6s. per share, in addition to the 5 per cent. already paid, making 17½ per cent. for the year 1909. The total for 1908 was 15 per cent.

Oxford Electric Co., Ltd.—Subject to final audit, the directors recommend a dividend on the ordinary shares capital at the rate of 9 per cent., free of income-tax, for the half-year ending December 31st, 1909, making with the interim dividend paid in September last 7 per cent. for the year. This is at the same rate as for 1908.

Mather & Platt, Ltd.—The directors have announced a dividend at the rate of 10 per cent. per annum, with a bonus of 2 per cent., tax free, less the interim dividend of 5 per cent. already paid on 400,000 old shares.

Metropolitan District Railway Co.

THE directors' report for the half-year ended December 31st, 1909, which was submitted to the meeting held on Wednesday, states that the expenditure on capital account during the half-year was £42,642. The growth of traffic and revenue continues to be most satisfactory. The gross receipts on revenue account were £279,611, being an increase of £17,737 on the receipts for the corresponding half of last year. The working expenses have amounted to £152,673, being a decrease of £1,195. After providing for interest and other charges and setting aside £10,000 as a reserve for renewals, the net revenue account shows a credit balance of £25,942, and the directors recommend that a dividend at the rate of £4 per cent. per annum be declared on the 4 per cent. guaranteed stock payable on February 11th. The following table gives a summary of comparative figures for the second halves of the years 1909 and 1908 :—

	Half-year ended Dec., 1909.	Dec., 1908.	Inc. or dec.	Or per cent.
Gross revenue	£279,611	£261,874	+17,737	6·77
Working expenditure..	152,673	153,868	—1,195	0 78
Passengers, including workmen and season ticket holders' journeys ..	33,902,406	31,503,722	+2,398,684	7 61
Passengers at workmen's fares ..	6,421,158	5,727,058	+694,100	12 12
Passenger receipts	£260,767	£243,117	+17,650	7·26
Average receipt per passenger ..	1·85d.	1·85d.	—	—
Train-mileage on District Railway	1,638,100	1,519,673	+118,427	7·79
Car-mileage on District Railway ..	6,464,555	6,167,698	+296,857	4·81

The accumulated arrears of dividend on the guaranteed stocks of the company now amount to £246,754. It is evident that on the most favourable view of prospects which can be taken, a long time would elapse before these accumulated deficiencies could be paid out of future net revenue, and representations were made to the directors on behalf of holders of guaranteed stock and first preference stock that it would be advantageous to both these stocks, and would improve the credit of company, if some scheme could be devised for settling the arrears by capitalisation on some equitable basis.

The directors took steps to ascertain the views of the large holders of each class of stock principally affected, and thereupon deposited a Bill in Parliament for sanctioning a scheme, the particulars of which are being circulated amongst the stockholders.

The company's traffic west of Turnham Green is worked, under running power arrangements, over the railway of the L. & S.W.R. Co. between Turnham Green and Studland Road Junction, near Ravenscourt Park. That section of railway consists of only two tracks, and has become quite insufficient to carry this company's trains and the trains of other companies which use the same tracks, and unless more running accommodation can be provided the development of the company's traffic will be seriously restricted.

An agreement has been made with the South-Western Co. providing for the construction of additional tracks which will give this company the exclusive use in perpetuity of two tracks west of Studland Road Junction. The whole cost of the proposed works, estimated at £386,877, including land, is to be paid by the South-Western Co., and interest on the actual cost is to be paid by this company at the rate of 4 per cent. per annum in addition to the existing annual payment for running rights. Provision is made in the agreement enabling this company, if they desire to do so, to repay at any time on six months' notice to the South-Western Co. the cost of certain portions of the proposed works which will be upon the District Co.'s property, estimated at £50,000.

The directors believe that the improvement in working which will be effected, and the additional train services which will be run when the proposed works are completed, will enable the company to secure a substantial addition to their net revenue.

Authority to construct the proposed works and sanction for the agreement relating thereto are sought in the Bill promoted by the company.

A Bill is being promoted in Parliament by the Charing Cross, Euston and Hampstead Railway Co. seeking power to extend their railway from its present terminus at Charing Cross to a point under this company's Charing Cross Station, and to make agreements with this company and the Baker Street and Waterloo Railway Co. with reference to the construction, working, maintenance and user of the proposed railway and of any station or works connected therewith. It is intended to provide a direct connection by lifts between the proposed new station of the Hampstead Co. and the existing stations of this company and the Baker Street Co. The interchange of traffic between the three companies will thereby be greatly improved, and it is expected that this company will obtain a substantial amount of additional through traffic. The cost of the proposed railway and works is estimated at £303,000. An agreement will be made providing for annual payments by this company and the Baker Street Co. to the Hampstead Co. on the basis of the benefits which each company will derive from the exchange of through traffic.

The promoters of a Bill which has been deposited in Parliament for power to construct a railway from Sutton to Wimbledon have requested this company to approve the Bill at a Wharncliffe meeting, so as to enable the proposed Wimbledon and Sutton Railway Co., if the Bill passes into law, to make agreements with this company as well as with the L. & S.W.R. Co. and the L.B. & S.C.R. Co. as to the construction, joint working, use, management and maintenance of the proposed railway, and as to the interchange of traffic, appointment of joint Committees, &c. The directors do not propose to give any financial support to the Wimbledon and Sutton scheme, but in view of the advantage which this company and the public would derive from the construction of the proposed railway, they recommend the proprietors to approve the Bill so far as the above-mentioned powers to make agreements are concerned.

TRAIN AND CAR-MILEAGE, HALF-YEAR ENDED DECEMBER 31ST, 1909.

Train-mileage.	On District Railway. District Co.'s trains.	Other Co.'s trains.	Total.	Total miles run by District trains, including mileage, on joint and foreign lines.
Passenger trains—Steam (L. and N.W.)	—	14,776	14,776	—
Passengers trains—Electric ..	1,479,425	141,313	1,620,738	2,164,144
Goods and mineral trains (Midland, &c.)	36	2,550	2,586	68
Total ..	1,479,461	158,639	1,638,100	2,164,212
Electric car-mileage	5,896,804	567,751	6,464,555	9,084,116
TOTALS HALF-YEAR ENDED DECEMBER 31ST, 1908.				
Train-mileage	1,288,282	231,391	1,519,673	1,852,167
Electric car-mileage	4,983,059	1,184,639	6,167,698	7,601,236

South London Electric Supply Corporation, Ltd.—The directors recommend, subject to final audit, a dividend on the ordinary shares for the year 1909 at the rate of 5 per cent. per annum. For 1908 the ordinary dividend was at the same rate.

Liverpool Overhead Railway Co.

THE report of the directors for the half-year ended December 31st, 1909, which was adopted at the meeting held on Tuesday, states that the gross revenue receipts amount to £36,912, and the working expenses to £28,313. The number of passengers carried during the last two years is as follows:—

	Half-year ending June, 1908.	Dec., 1908.	June, 1909.	Dec. 1909.
First class	597,991	566,162	548,612	553,409
Third class (incldg. trmys.) ..	3,059,757	3,204,823	2,932,867	3,184,636
Workmen (special rtrn. tkts.)..	1,709,548	1,396,480	1,4 9,236	1,477,506
Total	5,367,286	5,167,464	4,900,216	5,215,651

There has been an increase in the number of passengers carried during the past half-year, but there has been a decrease in the revenue of £380. This is the result of the reduction made in the price of workmen's special return tickets necessary to meet competition. The working expenses show a gratifying reduction of £1,345, after providing £873 towards the final settlement of claims arising out of the accident at Seaforth Sands Station in December, 1908. The structure and rolling stock have been well maintained, and are in good and efficient condition. Receipts from passenger traffic amount to £35,861; miscellaneous receipts and interest, £1,051, = £36,912; less working expenses and transfer to renewal fund, £28,313, = £8,599; deduct interest on mortgage debentures and on calls paid in advance, £4,329, = £4,269; plus balance brought forward, £4,696; leaving available for dividend, £8,966. Out of this balance the directors recommend the declaration of dividends at the rates of 5 per cent. per annum (less income-tax) on the (1892) preference shares, and 5 per cent. for the year (less income-tax) on the (1900) preference shares, payable on and after February 10th next, leaving a balance of £4,613 16s. 4d. to be carried forward to next half-year.

Mexican Light and Power Co., Ltd.

AT the special meeting of shareholders of this company, held in Toronto on the 20th ult., resolutions were unanimously passed increasing the capital stock of the company by the creation of 36,000 additional preference shares and 54,000 ordinary shares of $100 each.

According to statements appearing in the financial papers, the CHAIRMAN of the meeting announced that the company had recently purchased the entire capital stock of the Compania Electrica e Irrigadora del Estado de Hidalgo, S.A. Pachuca, and that the transmission lines of the Mexican Light and Power Co., Ltd., would be extended to Pachuca, a distance of about 30 miles, for the purpose of supplying the further demands for power in that district from the Necaxa hydraulic-electric plant. The Compania Electrica has a hydraulic-electric plant of its own of 12,000 H.P., and at the present time is supplying about 7,000 H.P., and has additional business in sight, a large proportion of which is already under contract, amounting to at least 6,000 H.P., which will be supplied as soon as the power can be furnished. Pachuca is one of the most important mining districts in the Republic of Mexico, and, in addition to the new business already assured, as above mentioned, the demand for power will undoubtedly increase very rapidly, making this section one of the largest power-consuming districts supplied by the company within a short time. The mines at this point consist of ore bodies of enormous extent, and there is great development in progress due to the investment of large amounts of foreign capital in the purchase of old mines and their development and exploitation by modern methods and machinery.

As the cost of the operation of the Mexican Light and Power Co.'s installation will only be slightly enhanced by the addition of this new business, the acquisition of the Compania Electrica should add very materially to the net income of the company. The Mexican Light and Power Co., Ltd., has now under construction an addition to its plant of 50,000 H.P., which will be completed during the present year, and which will bring the total capacity of its installation up to 100,000 H.P., thus providing ample power to satisfy all demands of the Federal district, including El Oro, and the new territory of Pachuca.

Dublin and Lucan Electric Railway Co.—The directors report that the gross receipts for the half-year ended December, 1909, were £3,767, being £33 in excess of those of the corresponding period of last year. After providing for debenture interest there is an available balance of £1,241, out of which the directors recommend the payment of the usual half-yearly dividend on the 5 per cent. preference shares; that £350 be placed to the reduction of electrical equipment account, that sum clearing off the balance of the debt due to the contractors; and that the balance of £416 be carried forward to next half-year, as against £497 carried forward from the corresponding period of the previous year.

Buenos Ayres Tramways Co. (1904), Ltd.—The directors recommend the payment of a balance dividend of 1s. 3d. per share for the year ended December 31st, and that £3,700 be transferred to the general amortisation fund, £142 being carried forward.

National Electric Construction Co., Ltd.—Dr. G. T. Moody has been elected a director in place of Mr. W. Herbert Fowler, resigned.

Held Over.—The half-yearly reports of several London tube railway companies are held over, owing to heavy demands on our space.

St. James' and Pall Mall Electric Light Co., Ltd.

The directors' report for the year ending December 31st, 1909, states that the supply has been distributed from the Carnaby Street and Mason's Yard works of this company on a total connection of 11,865 kw., being an increase of 136 kw. For this purpose 5,587,351 units were generated at these works, and 5,764,690 units were purchased from the Central Electric Supply Co., Ltd. A dividend of 5 per cent. on the ordinary shares of the Central Electric Supply Co., Ltd., has been declared, in respect of which a sum of £2,500 will in due course be payable to this company. Having regard to the desirability of reconstructing the boiler plant at the Carnaby Street works and employing those at Mason's Yard, for the future, as a transformer sub-station for high-pressure supply instead of for generating, the directors have materially increased the amount written off to depreciation for 1909, and have transferred from the net revenue of the year a further sum of £3,500 to credit of the contingency fund. The net profits for the year 1909, applicable to dividends on shares, amount to £25,320, plus balance brought forward from 1908, £3,705 = £29,025, less interim divided paid in August last for half-year ending June 30th, at the rate of 7 per cent. on preference shares, £3,500, 10 per cent. on ordinary shares, £10,000, leaving £15,526 now to be dealt with. The directors now recommend a dividend at the rate of 7 per cent. on the preference shares for the second half-year (£3,500), a dividend on the ordinary shares for the second half-year of 5s. per share, making, with the interim dividend paid in August last a total distribution of 10 per cent. for the year £10,000, leaving to be carried forward £2,026. The following is a statement of electricity generated, sold, &c, for 1909:—

Board of Trade units, generated	5,587,351
" " purchased	5,764,690
Quantity utilised—Private supply	9,815,852
Public lighting..	189,086
Used on works	245,050
Total	9,749,488
Quantity expended in distribution	1,602,553
Total connections in kw., Dec. 31st, 1909 ..	11,865

City and South London Railway Co.

The meeting of this company was held on Tuesday last week, at 71, Finsbury Pavement, the Right Hon. C. B. Stuart Wortley, K.C., M.P., in the chair.

The Chairman, in proposing the adoption of the report (see Electrical Review, January 28th, page 147), said that when he addressed the shareholders this time last year he attributed their diminished gross revenue to the abnormally fine weather which had prevailed during the second half of 1908. He thought he might now claim to have then rightly connected cause with effect, for in the second half of 1909 the London weather returned to the familiar London type, and to-day they were able to congratulate themselves on an increase in gross revenue for the half-year of no less than £3,187, as compared with the corresponding period in 1908. What was even more satisfactory was that they had not only made good the diminution shown in 1908, but had received more gross revenue by £735 than they did in the second half-year of 1907, which was the first complete half-year after the opening of the Euston extension, and was, therefore, not comparable with any earlier half-year. This result had been achieved in face of the successive developments of competitive services in and after July, 1907. Against the increased gross revenue they had to set an increase in working expenses of £859, so that the percentage of working expenses worked out at 45·92 against 46·61 at this time last year, and the resulting balance of net revenue was £2,328 better than last year. From this had to be deducted an increase of £249 in interest on borrowed money, leaving £2,079 more available for dividend on the actual working of the half-year. The sum brought in from the July account having been less in 1909 than in 1908, they carried forward less by £242 than they did this time last year. They would not suppose that the more normal weather alone had sufficed to enable them to show improved results in spite of more severe competition. It was due also to two important new departures in policy that had been entered upon. Taking, first, the reductions in fares, they must bear in mind that they were such that in order to secure the same gross yield as before they required to attract 15 per cent. more passengers between the points affected. Such an increase in the number of passengers meant heavier train-loads and more train-mileage, yet the receipts per train-mile had increased from 28·7d. to 29d., while the expenses per train-mile had actually declined from 14·16d. to 14·10d. The trains had, in fact, been better filled. The average number of passengers per train had been 117·3, against 113·9; and the receipts per train had gone up from 17s. 6·62d. to 17s. 9·35d. A reduced scale of charges for season tickets had been justified by improved receipts, and a source of revenue which had given signs of declining had been thereby converted into an improving figure. The earlier service on Sundays had yielded an increased revenue, averaging rather under £30 per week. This resulted not only from an increased use of their own line, but also from improved facilities thereby given for interchange with other railways. Taking interchange bookings with other companies on all days of the week throughout the half-year, it was interesting to note that they showed a net improvement of £500, notwithstanding the fact that the second half of 1908 included a sum of £900 derived from interchange bookings to and from the Franco-British Exhibition, for which there was no equivalent in 1909. In 1910 the improvement in these booking ought to be yet greater, for they had to look forward to an Empire Pageant at the Crystal Palace, and the Japanese Exhibition at Shepherd's Bush. They had carried a total of 11,234,074 passengers in the half-year. This was not only more by half a million than they had carried in any previous December half-year, but was also well over the total carried in any half-year in their history. Of these, nearly 25 per cent. were carried at workmen's rates, yielding less than 1¼d. per journey. A further 29 per cent. were "through" passengers exchanged with other railways, from whom they received less than 1½d. per journey. The average fare from all sources was at the low figure of 1·71d., against 1·75d. in 1908. Rates and taxes had increased by £125. An expenditure of £951 on renewal account was represented almost entirely by the replacement of old rails by new ones. With the exception of a few yards the whole of the old line between Stockwell and the Borough had now been relaid. Among other activities they had not neglected the persuasive and fruitful arts of advertisement. It was most important to inform and teach the public in all possible ways how extensive were the facilities open to them for rapid underground transit, and how many points in London were now connected by underground routes which could be followed from point to point without need for the traveller to come to the surface until his destination was reached. It must be clear to many that over distances such as Clapham Common to Euston, Shepherd's Bush to the Bank, and Charing Cross to the heights of Hampstead, or the leafy lanes of Golder's Green, the Tubes and Underground lines must always have the advantage over tramways, motor-buses, and other competing means of transit on the surface. What taxed the ingenuity and enterprise of Tube managers was to attract and keep the patronage of short-distance passengers as well. That was why they carried on this campaign of education; and that was what made it their policy to induce the customer when they had got him underground to stay underground and do as large a part as possible of his journey underground. But if facilities were to be honestly advertised, facilities must be extended and multiplied as occasion might demand. It was in pursuit of this policy that they had agreed to join in the construction of a new subway to join their (Moorgate) station to the contiguous stations of the Metropolitan and Great Northern and City Companies. The traffic exchanged at this junction between the Metropolitan and themselves was an increasing business; and there could be no doubt that here they had the best possible opportunity for extending the policy of keeping the passenger underground by saving him as much as possible from having to go up and down stairs and lifts. The proportion of the cost to be borne by this company was not expected to exceed £3,000.

Mr. C. Seymour Grenfell seconded the motion.

Mr. McKay asked whether there was any probability that the rolling stock of the railway would be assimilated to that of the other underground lines. Their carriages were rather obsolete as compared with the newer tube lines, and he thought it would be to the advantage of travellers if the change he had suggested could be carried out. He also noticed that their trains were drawn by heavy locomotives, which he should think must entail much greater wear and tear on the permanent way than the motor arrangement in vogue on the other underground lines.

Mr. Collins asked whether there was any probability of the old disused line under the Thames ever coming into use again?

Col. Perry inquired whether the Bakerloo Railway had at any time been approached with the object of extending the City and South London line as far as Regent's Park?

The Chairman, replying to the questions, said that it was impossible to assimilate their rolling stock to that of the other tube railways, as their tunnels were 12 in. smaller in diameter. They, however, did all they could to make them as bright and pleasant as possible. As to their locomotives, there were two advantages in having separate locomotives—one was that it gave them greater safety against fire; and, secondly, they were able to say that their weight per seat of a complete train, including the locomotive, was less than that of any other tube railway. With regard to the old tunnel under the Thames, they had had offers for renting it from some enterprising persons who wanted it to grow mushrooms in, but the directors did not see their way to let it for that purpose. If anybody wanted to lay telephone cables or electric power cables or the like under the river, the tunnel would afford a very excellent opportunity for them to do so at a very reasonable rent. They had not approached the Bakerloo Railway regarding an extension to Regent's Park. As at present advised, he thought they had better stick to the property they had got and not make speculative extensions except on very favourable terms.

The report was then adopted.

City of London Electric Lighting Co., Ltd.—The directors last week decided, subject to the completion of the audit, to place £45,000 to reserve and to recommend the following dividends:—12s. per share, being at the full rate of 6 per cent. per annum on the preference shares; 14s. per share (being at the rate of 7 per cent. per annum) on the ordinary shares. On account of these dividends, 6s. per preference share and 5s. per ordinary share was paid in August, 1909, and the balance remains to be paid. After payment of the dividends and other appropriations about £24,000 will remain to be carried forward. For the year 1909 the ordinary dividend was 6 per cent., with £45,500 placed to reserve, and £26,500 carried forward.

Blackpool and Fleetwood Tramroad Co., Ltd.—The directors recommend a dividend at the rate of 9 per cent. £1,750 is placed to depreciation reserve account, £500 to general reserve account, and £2,578 is carried forward.

ELECTRIC TRAMWAY AND RAILWAY TRAFFIC RETURNS.

Locality.	Fortnight ended.	Receipts for the fortnight. £	Receipts for the fortnight. £*	No. of wks.	Total to date. £	Total to date. £*	Route miles open.	Inc.
Aberdeen	Feb. 2	2,210	— 73	35	48,986	— 910	..	..
Ayr	,, 5	333	— 21	28	11,397	— 172	8	..
Bath	,, 2	1,237	+ 140	5	3,306	+ 298	..	..
Belfast	,, 4	6,976	— 137	43	169,391	+ 6,023	57	..
Birkenhead	,, 6	2,032	+ 23	44	47,346	+ 22	13·63	..
Birmingham Corp.	Jan. 29	13,010	+ 795	44	290,509	+10,398	..	..
Blackburn	,, 26	1,878	+ 72	44	47,751	— 1,294	14·13	..
Blackpool Corp.	Feb. 3	647	+ 8	..	52,278	+ 4,338	..	..
†Blackpool-Fleetw'd	,, 5	234	+ 3	5	1,088	— 138	..	..
Bolton	Jan. 30	3,955	— 61	44	101,812	+ 664	26	..
Bournemouth	Feb. 2	2,549	+ 189	44	73,100	+ 1,118	21·96	..
†Bradford	Jan. 29	4,087	+ 27	43	211,184	+ 7,889	54·81	..
Brighton	Feb. 6	1,398	+ 40	44½	42,941	+ 2,056	9·5	..
Bristol	,, 4	10,151	+1,159	..	..	..	..	..
Brit. Elec. Trac. Co.								
Airdrie	Jan. 23	385	— 12	4	884	+ 49	3·65	..
Barnsley	,, 28	323	+ 13	,,	633	+ 6	..	..
Barrow	,, 28	410	+ 25	,,	818	+ 48	5·37	..
Cavehill	,, 28	94	— 5	,,	198	— 7	..	..
Devonport	,, 28	820	+ 110	,,	1,673	— 11	8·85	..
Gateshead	,, 28	1,767	— 94	,,	3,752	— 2	11·25	..
Gravesend	,, 28	349	+ 24	,,	729	+ 41	6·5	..
Greenock	,, 28	921	+ 98	,,	1,872	+ 222	7·25	..
Hartlepool	,, 28	370	+ 1	,,	789	+ 9	6·72	..
Kidderminster	,, 28	155	+ 7	,,	320	+ 9	..	..
Leamington	,, 28	277	+ 14	,,	555	— 4	..	..
Merthyr	,, 28	355	— 27	,,	729	— 55	2·9	..
Metropolitan	,, 28	11,063	+2,005	,,	25,085	+ 4,103	22	..
Middleton	,, 28	462	— 65	,,	998	— 97	8·5	..
Mid. Joint Com'tee	,, 28	10,341	+ 115	,,	20,366	+ 257	..	..
Oldham—Ashton	,, 28	947	— 22	,,	1,955	— 34	9·13	..
Peterborough	,, 28	183	+ 10	,,	376	+ 15	5·31	..
Potteries	,, 28	3,338	..	,,	6,667	— 146	29	..
Rothesay	,, 28	78	+ 9	,,	194	+ 24	2·75	..
Southport	,, 28	578	— 41	,,	828	— 49	8·17	..
S. Metropolitan	,, 28	1,289	+ 53	,,	2,774	+ 126	..	..
Swansea	,, 28	1,038	+ 233	,,	3,823	+ 449	12·5	..
Tynemouth	,, 28	282	— 5	,,	564	+ 63	3·75	..
Weston-s-Mare	,, 28	45	— 13	,,	107	— 1	8	..
‡Worcester	,, 28	448	+ 34	,,	934	+ 12	5·75	..
Wrexham	,, 28	169	— 3	,,	348	— 8	..	..
Yorks. Wool. Dist.	,, 28	1,705	+ 136	,,	3,547	+ 274	17	..
Miscellaneous	,, 28	353	+ 16	,,	737	+ 47	..	..
Burnley	Feb. 5	2,076	— 116	..	..	..	..	..
Burton-on-Trent	,, 6	486	+ 45	45	11,867	— 124	6·63	..
Bury	Jan. 20	1,815	— 70	43½	50,183	— 231	22·5	..
Cardiff	,, 29	4,114	+ 367	44	96,345	+ 1,944	..	..
Carlisle	Feb. 5	£68	— 22	5	744	— 13	..	..
Chatham and Dist.	,, 3	1,320	+ 62	5	3,642	+ 101	14·98	..
Cork	,, 3	786	— 38	5	2,084	— 28	9·89	..
Croydon	Jan. 28	2,936	+ 616	..	68,907	+ 7,466	11·25	4·76
Darlington	Feb. 5	342	— 6	45	8,265	— 507	..	..
Darwen	,, 4	409	— 31	44	10,936	— 131	4·36	..
Dover	Jan. 29	310	+ 35	44	9,093	— 302	4·75	..
Dublin	Feb. 4	9,366	— 133	..	24,706	+ 280	54·25	..
Dundee	,, 2	2,065	— 161	37⅞	44,509	— 763	15·5	..
East Ham	,, 5	1,764	+ 123	44½	44,574	+ 5,115	8·52	·77
Exeter	,, 4	509	+ 33	45	14,701	+ 681	5·5	..
Glasgow	,, 5	31,619	—2,134	..	602,656	— 7,810	94½	5
Hastings	,, 3	1,265	— 43	..	..	..	..	..
Huddersfield	Jan. 29	3,001	+ 233	43	72,547	+ 8,905	28·5	·5
Hull	Feb. 5	5,200	+ 441	44	116,591	+ 5,747	14·5	1·5
Ilkeston	,, 2	230	+ 8	44	5,872	— 242	..	..
Ipswich	,, 5	588	+ 21	45	17,648	+ 302	10·5	..
Kilmarnock	,, 5	254	— 28	33	5,553	— 258	4·25	..
Lancashire United	,, 2	2,063	— 122	5	5,506	— 25	39	..
†Leeds	Jan. 29	5,611	— 52	43	295,585	+ 9,120	..	..
Leicester	.. ..	..	..	..	..	..	..	..
Leith	,, 29	1,009	+ 88	37	22,250	+ 2,760	9	3
Liverpool	,, 29	20,061	— 77	4	43,657	+ 471	109·5	2
‡L.C.C.	,, 22	76,888	+9,492	..	1,590,995	+99,071	..	..
London United	Feb. 5	9,738	+ 588	..	26,843	+ 1,460	..	..
Lowestoft	,, 5	296	+ 25	19	2,949	+ 143	3·5	..
Manchester	,, 5	27,704	— 261	45	664,452	— 5,921	..	..
Newcastle	,, 5	7,281	— 387	..	178,619	— 4,503	14·5	..
†Newport	Jan. 29	563	+ 81	44	28,719	+ 87	14·5	..
Oldham	Feb. 6	2,819	— 702	45	81,185	— 6,679	23·75	..
†Pontypridd	Jan. 29	360	+ 16	43½	17,815	+ 1,157	5·5	..
Portsmouth	,, 29	1,499	+ 68	44	90,115	+ 3,807	14·5	..
Preston	Feb. 2	1,169	— 94	..	..	..	..	..
Rotherham	,, 3	1,060	— 25	44	26,087	— 992	13	2
Salford	Jan. 31	8,052	+ 111	42⅝	168,845	— 3,502	..	..
Sheffield	Feb. 6	10,889	+ 466	45⅞	257,701	+ 5,340	40	..
Southampton	,, 2	1,872	+ 132	44	47,143	+ 98	..	..
Southend-on-Sea	,, 2	665	+ 140	44	22,3 2	+ 3,166	..	..
South Shields	,, 5	985	+ 15	44½	24,928	+ 64	..	..
†Swindon	Jan. 26	137	+ 84	..	..	..	..	..
Tyneside	Feb. 2	604	— 119	5	1,615	— 195	..	..
Wallasey	,, 5	1,462	— 59	44⅞	40,457	+ 793	..	..
Walthamstow	,, 5	1,681	+ 123	45	29,158	+ 1,179	9	..
West Ham	Jan. 27	4,472	+ 517	43	101,789	+ 6,679	15·25	..
Wolverhampton	Feb. 3	1,482	+ 211	44	37,586	+ 1,334	12·5	1·75
Baker St.-Waterloo	,, 5	6,985	— 80	5	17 585	+ 305	4·25	..
Cen. London Rly.	,, 5	11,137	— 325	5	27,809	— 619	6·32	·55
Char. +, Sus. Hamp.	,, 5	7,580	— 80	5	19,400	+ 145	7·75	..
City & S. Lon. Rly.	,, 5	6,728	+ 6	5	16,792	— 397	7·2	..
Dublin-Lucan Rly.	,, 4	168	— 51	5	480	— 69	7	..
G.N. and City Rly.	,, 5	3,175	— 101	5	7,960	— 101	3.5	..
G.N., P'y. & Brmm.	,, 5	12,165	+ 245	5	30,790	+ 1,140	9·25	..
L'pool Overh'd Rly.	,, 5	2,470	— 168	5	7,685	— 321	6·8	4·3
Llandudno-Col. Bay	,, 4	199	+ 14	9½	1,076	+ 70	..	..
Mersey Railway	,, 5	3,325	— 97	5	9,987	+ 91	4·5	..
Metropolitan Rly.	,, 6	32,670	+ 978	5	83,125	+ 2,629	24·5	..
Met. District Rly.	,, 5	21,214	+1,704	5	58,775	+ 4,876	24	..
Anglo-Argentine	,, 4	33,986	+3,347	..	212,021	+18,609	..	..
‡Auckland	Jan. 28	14,973	+1,361	..	..	..	23·2	1·38
Bombay (B.E.T.)	,, 1	5,488	+ 510	..	..	..	..	..
‡Brisbane	Dec.	18,390	+1,675	52	198,322	+20,789	..	..
‡Brit. Columbia Rly.	.. ..	..	..	..	..	..	..	..
†Calcutta	Feb. 5	6,698	+ 103	..	..	..	..	..
‡CapeElectricT.Ld.	.. ..	..	..	..	..	..	..	..
‡Kalgoorlie, W.A.	Dec.	3,666	..	52	45,128	..	20·5	..
Madras	Jan. 31	1,473	+ 73	4	2,910	+ 71	..	..
‡Lisbon	.. ..	..	..	..	..	..	..	..
Perth (W.A.)	Feb. 4	3,942	+ 133	5	8,171	+ 447	33	

* Compared with the corresponding period of 1909. † One week only.
‡ Includes horse, steam and other receipts. ‡ One month.

STOCKS AND SHARES.

Tuesday Afternoon.

Money market conditions being favourable to investment, it is rather surprising that quotations for gilt-edged securities do not show more appreciation of the ca e in Lombard Street. That they should be, comparatively speaking, indifferent, must be ascribed to the fear of heavy new issues in the near future. But the prior-charge stocks connected with electricity are far from being weak, and it needs only a breath of inquiry to disclose the poverty of the market in regard to supply of stock, with the result that prices have to be put up, and even then the would-be buyer cannot count upon getting what he wants.

The unexpectedly good dividend declared by the City of London Electric Supply Company led to a £1 rise in the price of the Ordinary shares and of 5s. in the Preference, while the Debenture stock is 1 up. The City Company, as the manager of a friendly rival explained, scores very heavily because of the extension of London downwards. He went on to point out that refreshment places, such as the Aerated Bread, Lyons' and Slater's Companies, almost always have at least one or two rooms underground, where the electric light is burning all day long. This, no doubt, has something to do with the company's prosperity, which, at all events, is very pleasant to chronicle, and which it may be hoped will prove the precursor of cheerfuller days for proprietors of other metropolitan electric lighting shares. This week there is not much other change. London Electric Preference gained ¼, and so did Charing Cross City Undertaking Preference shares. The demand for Edmundson's Debenture is still a pronounced feature, and the stock shows a gain of another 4 points this week.

Electrical Railway stocks are dull and depressed. City and South London slipped back ½; Central Londons have made no rally from their fall. Districts came down ⅜, there being no support for the stock. Underground Electric 4½ per cents., and the Income bonds, are both 1 lower. Brighton Railway stocks are amongst the firmest, in spite of the recent disaster, and it is said that the new electric line is doing very well. The chairman, at last week's meeting, spoke hopefully of its prospects, but, perhaps, this is no more than might have been expected.

Another of last week's meetings, which had a very different sort of result, was that of the Anglo-American Telegraph Co., following which came an acute fall in the price of the Deferred stock. After the encouraging nature of the report, the remarks made at the meeting came as a somewhat unpleasant surprise, and although the market in the Stock Exchange tried to make the best of it by calling the chairman hyper-cautious, this did not save the drop, though it may have had something to do with the subsequent rally that lifted the price above the lowest reached. The Ordinary stock is only ½ down, and the Preferred is unchanged, from which it is not an unfair inference to assume that market manipulation had a good share in depressing the Deferred stock.

Eastern Extension shares and Eastern Telegraph stocks are all rather better, and West India and Panama Telegraph shares have also hardened. American Telephone and Telegraph capital stock reacted; otherwise, telephone descriptions have been firm. National Telephone Deferred rose 1, on consideration of the report, and United River Plate Telephone continued their steady advance.

The Tramway group keeps good on the whole, and a feature is the strength of London United Tramways Debenture stock, which is 4½ higher. Sir Clifton Robinson has resigned the managership of the company, and has been speaking bitterly of the burdens laid upon tramway undertakings by local authorities and others. British Electric Tractions have maintained their rises. Anglo-Argentine Trams are ⅛ higher, Calcutta Trams ¼ lower. Mexico Trams rose 2, and Ohio Trams hardened to 96½. Mexican Light and Power issues are quiet, the Preferred with a point gain being the only one to show alteration.

British Aluminium shares have descended yet further, on the scheme of reorganising the finances of the company, and the quotations are becoming well nigh nominal. Callender's Ordinary shares have advanced, and so have Henley's. Willans & Robinson Debenture shed 2. British Westinghouse 6 per cent. prior lien Debenture at 99½ is the fraction better. Rubber shares show renewed buoyancy, and the market has sharply recovered from its bout of weakness at the end of last week.

South London Electric Supply Corporation, Ltd.—The directors recommend a dividend on the ordinary shares for 1909 at the rate of 5 per cent. per annum. The rate for 1908 was the same.

SHARE LIST OF ELECTRICAL COMPANIES.

TELEGRAPH AND TELEPHONE COMPANIES.

Present Issue.	NAME.	Stock or Share. *	Dividends for the last four years. 1906.	1907.	1908.	1909.	Closing Quotations Feb. 1st.	Closing Quotations Feb. 8th.	Business done week ended Feb. 8th, 1910. Highest	Lowest.	Rise + or Fall —	Present Yield per cent. £ s. d.
25,000	Amazon Telegraph Co.'s shares, Nos. 1 to 25,000	10	Nil	Nil	Nil	..	3⅜ — 3¾	3⅜ — 3⅝	..	..	..	Nil.
136,700	Do. do. 5 % Debs., Nos. 1 to 1,359 Red.	100	5 %	5 %	5 %	5 %	99 —102	99 —102	..	..	..	4 18 0
$181,551,400	American Telephone & Telegraph, Cap. Stock ..	$100	8 %	8 %	8 %	8 %	140 —142	138 —140	141½	..	—2	5 14 4
$58,000,000	Do. Collat. Trust, 4% Bonds, 1 to 28,000 and 55,001 to 75,000	$1000	4 %	4 %	4 %	4 %	94 — 96	94 — 96	..	..	..	4 3 4
558,460	Anglo-American Telegraph	Stock	3⅞%	3¾%	£3 4s.	3⅜%	60¼ — 62½	60 — 62	..	..	— ½	5 17 6
3,220,770	Do. do. do. 6 % Pref.	Stock	6 %	6 %	6 %	6 %	100⅜ —101½	100⅜ —101⅜	101½	101½	..	5 17 11
3,220,770	Do. do. do. Deferred	Stock	1¾%	1 %	8/-	25/-	21 — 21½	19⅜ — 19⅞	20⅜	19⅜	—1⅜	6 5 9
47,725	Anglo-Portuguese Tel., 5 % Mort. Deb. Stock Red.	100	5 %	5 %	5 %	..	101 —103	101 —103	101½	..	..	4 17 1
44,000	Chili Telephone, Nos. 1 to 44,000	5	8 %	8 %	8 %	..	7½ — 8⅛	7⅝ — 8¼	..	..	..	4 18 6
2,481,850	Commercial Cable, Sting. 500 year 4% Deb. Stk. Red.	Stock	4 %	4 %	4 %	4 %	86 — 88	86 — 88	87½	87	..	4 10 11
16,000	Cuba Telegraph	10	5 %	6 %	6 %	..	8¾ — 9½	8¼ — 9⅛	..	..	..	6 9 9
6,000	Do. 10 % Pref.	10	10 %	10 %	10 %	..	17 — 18	17 — 18	..	..	— 1⅛	5 11 1
12,981	Direct Spanish Telegraph, Ord.	5	4 %	4 %	4 %	..	8 — 8¼	8 — 8¼	..	..	..	5 14 8
6,000	Do. do. 10 % Cum. Pref. ..	5	10 %	10 %	10 %	..	8 — 8¼	8 — 8¼	..	..	..	6 5 0
80,000	Do. do. 4½ % Debs.	50	4½%	4½%	4½%	4½%	100 —102	100 —102	..	..	..	4 8 3
60,710‡	Direct United States Cable	20	4½%	4½%	4½%	..	13⅜ — 14⅛	13⅜ — 14⅛	14⅛	13⅜	..	5 19 1
39,500‡	Direct W. India Cable, 4½ % Reg. Deb., 1 to 1,900, R.	100	4½%	4½%	4½%	4½%	99 —101	99 —101	..	..	..	4 9 1
4,000,000	Eastern Telegraph, Ord. Stock	Stock	7 %	7 %	7 %	..	133 —136	134 —137	134½	131½	+1	5 2 2
2,000,000	Do. 5½ % Pref. Stock	100	5½%	5½%	5½%	5½%	85 — 87	85½ — 87½	87	85½	+ ½	4 0 0
1,996,706	Do. 4 % Mort. Deb. Stock. Red. ..	Stock	4 %	4 %	4 %	4 %	102 —104	102½ —104½	103½	102	— ½	3 16 7
800,000	Eastern Extension, Australasia, and China Tele	10	7 %	7 %	7 %	..	12½ — 12⅝	12⅝ — 12¾	12¾	12½	+ ⅛	5 8 9
752,400	Do. 4 % Deb. Stock	Stock	4 %	4 %	4 %	4 %	101 —103 xd	101 —103	103	..	..	3 17 8
200,000‡	East. & S. Afric. Tel., 4 % Mt Db. Mauritius Sub.) 1 to 8,000	25	4 %	4 %	4 %	4 %	99 —101	100 —102	..	..	+1	3 18 8
181,127	Globe Telegraph and Trust	10	5½%	5½%	5½%	..	10⅜ — 10⅞	10⅜ — 10⅞	10⅜	10⅞	..	5 6 1
181,127	Do. do. 6 % Pref.	10	6 %	6 %	6 %	..	13⅛ — 13⅝	13⅛ — 13⅝	13⅛	13⅝	..	4 6 6
150,000	Great Northern Telegraph, of Copenhagen	10	20 %	20 %	18 %	..	29½ — 30½	29½ — 30½	..	..	..	5 16 2
5,000‡	Halifax and Bermudas Cable, 4½ % 1st Mort. Debs., within Nos. 1 to 1,900, Red.	100	4½%	4½%	4½%	4½%	99 —101	98½ — 100½	..	..	..	4 9 1
17,000	Indo-European Telegraph	25	18 %	18 %	18 %	..	51 — 53	51 — 53	..	..	..	6 2 8
$41,320,400	Mackay Companies Common	$100	3½%	4 %	4 %	4½%	91 — 93	91 — 93	..	..	..	4 11 8
$50,000,000	Do. do. 4% Cum. Pref.	$100	4 %	4 %	4 %	4 %	78 — 83	78 — 83	..	..	..	4 16 5
394,190	Marconi's Wireless Telegraph	1	Nil	Nil	Nil	..	3¼ — 3⅜	3⅛ — 3⅜	15/6	14/4½	..	Nil
72,680	Monte Video Telephone Co., Ltd. Ord.	1	6 %	6 %	6 %	..	1⅛ — 1⅜	1⅛ — 1⅜	..	..	..	6 5 0
86,492	Do. do. do. 5 % Pref. ..	1	5 %	5 %	5 %	..	2 — 2⅛	2 — 2⅛	..	..	..	5 6 8
2,235,000	National Telephone, Pref. Stock	100	6 %	6 %	6 %	6 %	107 —108½	107 —108¼	108	107½	..	5 10 7
3,725,000	Do. do. Def. Stock	100	6 %	6 %	6 %	6 %	123 —125	123½ —125½	124½	123½	+ ½	4 8 7
15,000	Do. do. 5 % Cum. 1st. Pref.	10	6 %	6 %	6 %	6 %	10½ — 11½	10½ — 11½	..	..	..	5 6 8
15,000	Do. do. 5 % Cum. 2nd Pref.	10	5 %	6 %	6 %	6 %	10½ — 11	10½ — 11	..	..	..	5 9 1
250,000	Do. do. 5 % Non-cum. 3rd P., 1 to 250,000	5	5 %	5 %	5 %	5 %	5⅞ — 5⅛	5⅞ — 5⅛	..	..	..	4 7 11
2,000,000	Do. do. 5½ % Deb. Stock Red. ..	Stock	5½%	5½%	5½%	5½%	98 —100	98 —100	98½	..	..	3 10 0
1,988,598	Do. do. 4 % Deb. Stock Red.	100	4 %	4 %	4 %	4 %	99½—101½	100 —102	..	..	+ ½	3 18 5
179,818	Oriental Telep. and Elec. 1 to 171,504, fully paid ..	1	7 %	8 %	8 %	..	1⅜ — 1½	1⅜ — 1½	28/9	27/9	..	5 5 9
50,000	Do. do. do. 6 % Cum. Pref... ..	1	6 %	6 %	6 %	..	1⅜ — 1⅝	1⅜ — 1⅝	..	..	..	4 14 9
99,100	Do. do. do. 4 % Red. Deb. Stock ..	100	4 %	4 %	4 %	4 %	86 — 88	86 — 88	87½	..	..	4 10 11
99,400	Pacific & European Tel., 4 % Guar. Debs., 1 to 1,000	10	4 %	4 %	4 %	4 %	98 —100	98 —100	..	..	..	4 0 0
11,889	Reuter's	5	5 %	5 %	5 %	..	7⅞ — 8¼	7⅞ — 8¼	..	..	+ ⅛	4 18 9
145,955	Telephone Co. of Egypt, 4½ % Deb. Red.	100	4½%	4½%	4½%	4½%	99 —101	99½—101¼	..	..	+ ⅛	4 8 8
3,042	Submarine Cables Trust	Cert.	6 %	6 %	6 %	..	129 —132	130 —133	..	..	+1	4 10 3
120,000	United River Plate Telephone	5	8 %	8 %	8 %	..	7 — 7½	7⅛ — 7⅜	7½	7⅛	+ ⅛	5 8 6
40,000	Do. 5 % Cum. Pref., Nos. 1 to 40,000	5	5 %	5 %	5 %	..	4⅜ — 5	4⅜ — 5	..	..	..	5 0 0
80,008	W. Coast of America, 1 to 80,000 & 53,001 to 53,008	2½	2½%	2½%	2½%	..	1⅜ — 1⅝	1⅜ — 1⅝	..	..	..	3 16 4
150,000	Do. 4 % Debs., 1 to 1,500 guar. by Bras. Sub. Tel.	100	4 %	4 %	4 %	4 %	98 —100	98 —100	99½	..	..	4 0 0
207,980	Western Telegraph, Ltd., Nos. 1 to 207,980.. ..	10	7 %	7 %	7 %	..	13⅜ — 14⅛	13⅜ — 14⅛	14¼	14	..	4 18 8
800,000	Do. do. 4 % Deb. Stock Red. ..	100	4 %	4 %	4 %	4 %	101 —103	101 —103	101	..	..	3 17 8
88,321	West India and Panama Telegraph	10	Nil	Nil	Nil	..	3⅜ — 3⅝	1¼ — 1⅜	..	..	..	Nil
84,563	Do. do. 6 % Cum. 1st Pref. ..	10	6 %	6 %	6 %	..	8⅝ — 9⅜	8⅝ — 9¼	9	8½	+ ⅛	6 9 9
4,669	Do. do. 6 % Cum. 2nd Pref.	10	Nil	£2 6	15 %	..	8 — 9	8 — 9	..	..	..	6 13 4
80,000‡	Do. do. 5 % Debs., Nos. 1 to 1,800 ..	100	5 %	5 %	5 %	5 %	100½—102½	100½—102½	..	..	..	4 17 7

ELECTRICAL RAILWAY, MANUFACTURING AND INDUSTRIAL COMPANIES.

640,000	Anglo-Argentine Trams, 5 % Cum. 1st Pref., 1 to 640,000	5	..	..	..	..	4⅞ — 4¹⁵⁄₁₆	4½ — 4⅝	98/1½	91/3	+1/6	5 5 5
500,000	Do. 5 % 2nd Pref., 500,001 to 1,000,000	5	..	..	..	..	4½ — 4⅝	4½ — 4⅝	84/4½	..	..	5 14 3
978,280	Do. 4 % Deb. Stock	Stock	..	..	..	4 %	90 — 91½	90 — 91½	91½	90½	..	4 7 5
882,387	Auckland E. Trams, 5 % 1st Mort. Deb. Stock ..	100	5 %	5 %	5 %	5 %	102 —105	104 —106	..	..	+1½	4 14 4
880,000	Babcock & Wilcox, 1 to 880,000..	1	20 %	20 %	20 %	..	4⅛ — 5⅛	4⅛ — 4⅝	5⅛	96/1½	..	5 19 2
100,000	Do. do. 6 % Cum. Pref., 1 to 100,000 ..	1	6 %	6 %	6 %	..	1⅛ — 1⅜	1⅛ — 1⅜	..	..	..	3 19 2
60,000	British Aluminium, Ord., 1 to 40,000	5	7 %	7 %	Nil	..	⅜ — ½	⅜ — ½	5/6	..	— ⅛	Nil
60,000	Do. do. 7 % Cum. Pref.	5	7 %	7 %	3½%	..	1⅜ — 1½	1⅜ — 1½	20/-	..	— ⅛	15 7 6
40,100	Do. do. "A" 6 % Cum. Pref.	5	6 %	6 %	6 %	..	2⅜ — 2½	2 — 2	..	..	— ⅛	10 0 0
12,897	Do. do. 4 % Funding Certs.	5	4 %	4 %	2 %	..	2 — 2¼	1 — 2	..	..	—1½	5 0 0
124,400	Do. do. 5½ % Loch Leven Debs. ..	100	5½%	5½%	5½%	5½%	95 — 98 xd	95 — 98 xd	..	..	..	5 12 3
500,000	British Columbia E. Rail Def. Ord. Stock	100	8 %	8 %	8 %	8 %	141 —145	140 —144	142	..	—1	5 11 1
400,000	Do. Pref. Ord. Stock	100	6 %	6 %	6 %	6 %	116 —120 xd	116 —120	118	..	..	5 0 0
400,000	Do. 5 % Cum. Perp. Pref. Stock	100	5 %	5 %	5 %	5 %	108 —111	108 —111	110½	109	..	4 10 1
233,000	Do. 4½ % 1st Mort. Debs., 1 to 6,250	40	4½%	4½%	4½%	4½%	102 —104	102 —104	..	..	..	4 6 7
212,600	Do. 4½ % Vancouver Power Debs., 1 to 2,200	100	4½%	4½%	4½%	4½%	101 —104	101 —104	104	..	..	4 6 7
188,801	British Electric Traction	10	Nil	Nil	Nil	..	1⅛ — 1⅜	1⅛ — 1⅜	30/-	..	..	Nil
161,487	Do. do. 6 % Cum. Pref.	10	6 %	3 %	1¾%	..	3¾ — 4	3¾ — 4	74/9	67/6	..	3 15 0
1,473,553	Do. do. 5 % Perp. Deb. Stock ..	Stock	5 %	5 %	5 %	..	89 — 92	89 — 92	91	90	..	5 8 8
528,986	Do. do. 4½ % 2nd Deb. Stock Red.	100	4½%	4½%	4½%	..	67 — 71	67 — 72	70	..	..	6 6 7
100,000	British Insulated and Helsby Cables	5	10 %	10 %	10 %	..	7⅝ — 7⅞	7⅞ — 7⅞	7⅞	..	..	6 9 0
100,000	Do. do. 6 % Cum. Pref.	5	6 %	6 %	6 %	6 %	6⅝ — 6¾	6⅝ — 6¾ xd	..	..	..	4 10 7
500,000	Do. do. 4½ % 1st Mort. Deb. Red. ..	100	4½%	4½%	4½%	4½%	103 —106	103 —106	..	..	..	4 4 11
204,940‡	British Thomson-Houston 4½ % 1st Mort. Debs. ..	100	4½%	4½%	4½%	4½%	89 — 94	89 — 94	..	..	..	4 15 9
400,000	British Westinghouse 6 % Pref., 1 to 200,000 and 275,001 to 75,000	5	Nil	Nil	Nil	..	½ — ¾	½ — ¾	19/6	..	..	Nil
1,916,858	Do. do. 4 % Mort. Deb. Stock ..	100	4 %	4 %	4 %	..	47 — 51	47 — 51	47½	..	..	7 16 10
50,000	Browett, Lindley & Co., Ord.	1	Nil	Nil	Nil	..	¹³⁄₁₆ — ¹⅞	¹³⁄₁₆ — ¹⅞	..	..	..	Nil
60,000	Do. do. 6 % Cum. Pref.	1	Nil	Nil	Nil	..	14/6 to 15/6	14/6 to 15/6	..	..	..	Nil
140,976	Brush Electrical Engineering, Ord., 1 to 105,781 ..	2	Nil	Nil	Nil	..	0 — ⅛	0 — ⅛	..	..	..	Nil
900,000	Do. do. Non-cum. 6 % Pref.	2	Nil	Nil	Nil	..	0 — ⅛	0 — ⅛	..	..	..	Nil
195,000‡	Do. do. 4½ % Perp. Deb. Stock ..	Stock	4½%	4½%	4½%	..	41 — 46	41 — 46	..	..	..	9 15 8
195,000‡	Do. do. 4½ % Perp. 2nd Deb. Stock..	Stock	4½%	4½%	4½%	..	25 — 29	25 — 29	..	..	..	15 3 0
137,610	Calcutta Trams, 1 to 137,610	5	8 %	6 %	4½%	..	4½ — 5	4½ — 4⅝	90/7½	90/-	— ½	4 14 9
46,804	Do. 5 % Cum. Pref., Nos. 1 to 29,880..	5	5 %	5 %	5 %	..	4½ — 5	4½ — 5	98/9	..	..	5 0 0
850,000	Do. 4½ % 1st Deb. Stock..	100	4½%	4½%	4½%	4½%	99 —102	99 —102	..	..	..	4 8 3
85,000	Callender's Cable Construction shares	5	15 %	15 %	15 %	..	10 — 10⅜	10⅛ — 10⅜	..	..	+ ⅛	6 17 11
40,000	Do. do. 5 % Cum. Pref.	5	5 %	5 %	5 %	..	5⅛ — 5⅜	5⅛ — 5⅜	..	..	..	4 10 11
800,000	Do. do. 4½ % 1st Mort. Deb. Stock Red.	Stock	4½%	4½%	4½%	4½%	102½—104½	102½—104½	..	..	..	4 6 2
491,223	Cape E. Trams., 1 to 491,223	1	Nil	Nil	Nil	..	2⅜ — 2⅞	2⅜ — 2⅞	..	..	..	Nil
450,000	Castner-Kellner Alkali, 1 to 450,000	1	8 %	12 %	12½%	..	2⅜ — 2½	2⅜ — 2½	49/3	42/9	..	5 0 0
910,158	Do. do. 4½ % 1st Mort. Deb. Stock	100	4½%	4½%	4 %	4½%	103 —106 xd	104 —107	106½	..	+1	4 4 1
1,890 690	Central London Railway, Ord. Stock	Stock	4 %	3 %	3½%	3 %	54 — 56	54 — 56	65½	64½	..	4 10 11
554,655	Do. do. 4 % Pref. Stock	Stock	4 %	4 %	4 %	4 %	85 — 87	85 — 87	86½	..	..	4 8 4
554,655	Do. do. Def. do.	Stock	4 %	2 %	2½%	2 %	46 — 48	46 — 48	47	46⅞	..	5 6 1
1,490,000	City and South London Railway	Stock	3½%	3½%	1¼%	1½%	32 — 33	31½ — 32½	33½	32	— ½	5 7 8
85,000	Crompton & Co., Nos. 1 to 85,000	5	5 %	5 %	Nil	..	⅜ — ½	⅜ — ½	..	..	..	Nil
100,000‡	Do. 5 % 1st Mort. Reg. Debs., 1 900 of £100, and 901 11,000 of £60 Red	..	5 %	5 %	5 %	5 %	88 — 91	88 — 91	..	..	..	5 9 11

* Unless otherwise stated, all shares are fully paid.

‡ From Manchester Share List.

Continued on next page.

SHARE LIST OF ELECTRICAL COMPANIES.—(*Continued.*)

ELECTRICAL RAILWAY, MANUFACTURING AND INDUSTRIAL COMPANIES.—(*Continued*)

Present Issue.	NAME.	Stock or Share.	Dividends for the last four years. 1906.	1907.	1908.	1909	Closing Quotations Feb. 1st.	Closing Quotations Feb. 8th.	Business done week ended Feb. 8th, 1910. Highest	Lowest.	Rise + or Fall —	Present Yield per cent. £ s. d.
350,000	Dick, Kerr & Co., 1 to 350,000	*	10 %	10 %	6 %	..	1 — 1¼	1 — 1¼	..	..	..	6 0 0
305,000	Do. do. 6 % Cum. Pref., 1 to 305,000 ..	1	6 %	6 %	6 %	..	1⅞ — 1 15/16	1⅞ — 1 15/16	..	..	..	5 9 1
271,080	Do. do. 4½ % Deb. Stock	100	4½ %	4½ %	4½ %	4½%	98 —101	99 —102	..	..	+1	4 8 3
60,000	Dublin United Trams. (1896), 6 % Pref., 1 to 60,000	10	6 %	6 %	6 %	..	12⅝ — 13⅜	12⅝ — 13⅜	..	..	..	4 7 8
99,261	Edison & Swan Utd., "A" shs., £8 pd., 1 to 99,261	5	4½ %	2½ %	Nil	..	3/16 — 5/16	3/16 — 5/16	..	..	..	Nil
17,189	Do. "A" shares, 01—017,189 ..	5	4½ %	2½ %	Nil	..	1 — 1⅛	1 — 1⅛	..	..	..	Nil
307,695	Do. 4 % Deb. Stock Red.	100	4 %	4 %	4 %	4 %	64 — 69	64 — 69	..	..	..	5 15 11
97,730	Do. 5 % 2nd Deb. Stock Prov. Certs. all pd.	100	5 %	5 %	5 %	..	81 — 84	81 — 84	..	..	..	5 19 1
119,100	Electric Construction, 1 to 119,100	2	Nil	Nil	Nil	..	1/16 — 3/16	1/16 — 3/16	..	..	..	Nil
31,890	Do. do. 7 % Cum. Pref., 1 to 31,890..	2	7 %	7 %	7 %	..	1¼ — 1½	1¼ — 1½	..	..	..	10 4 0
75,000	General Electric Co. (1900), 5 % Cum. Pref. ..	10	5 %	5 %	5 %	..	7⅞ — 8¼	7⅞ — 8¼	..	..	..	6 1 3
2 0,000	Do. do 4 % Mort Deb... ..	Stock	4 %	4 %	4 %	..	83 — 87	83 — 87	..	..	..	4 12 0
75,000	Gt. N. & City Rail. Pref. Ord. "A" 4 %, 1 to 75,000	10	4 %	¼%	Nil	..	3/16 — 5/16	3/16 — 5/16	..	..	..	Nil
96,000	Greenwood & Batley, 7 % Cum. Pref.	10	7 %	7 %	..	..	10½ — 10¾	10½ — 10¾	..	..	..	6 10 8
80,000	Do. do. 5 % Mort. Debs.	100	5 %	5 %	5 %	..	102 — 103	102 —103½	..	..	..	4 16 10
40,000	Henley's (W. T.), Telegraph Works, Ord.	5	6 %	12½ %	15 %	..	12 — 12⅜	12⅛ — 12⅜	..	..	+ ⅛	5 16 6
40,000	Do. do. 4½ % Pref.	5	4½ %	4½ %	4½%	..	5 — 5⅛	5 — 5⅛	..	..	..	4 8 9
150,000	Do. do. 4½ % Mort. Deb. Stock	Stock	4½ %	4½ %	4½%	..	104 —105	105 —107	..	..	+1	4 4 1
60,000	India-Rubber, Gutta-percha & Telegraph Works..	10	9 %	10 %	10 %	10 %	15 — 15⅜	15 — 15⅜	..	..	..	6 7 0
97,500	Liverpool Overhead Railway, Ord.	10	Nil	¼%	Nil	Nil	1 5/16 — 1 7/16	1 5/16 — 1 7/16	..	..	..	Nil
10,000	† Do. do. Pref., fully paid ..	10	5 %	5 %	5 %	5 %	4½ — 5	4½ — 5	..	..	..	10 0 0
800,070	London United Trams. (1901), 1 to 50,007	10	8 %	8 %	Nil	..	1½ — 2⅛	1½ — 2⅛	..	..	..	Nil
899,980	Do. do. 50,008 to 100,000	10	8 %	8 %	Nil	..	1½ — 2⅛	1½ — 2⅛	..	..	..	Nil
125,000	Do. do. 5 % Cum. Pref., 1 to 125,000	10	5 %	5 %	3⅜%	..	1⅝ — 2⅛	1⅝ — 2⅛	..	..	..	16 15 10
1,649,980	Do. do. 4 % 1st Mort. Deb. Stock ..	100	4 %	..	4 %	4 %	62 — 67	67 — 71	68½	..	+ 4½	5 12 8
5,782,062	Metropolitan Consolidated	100	1 %	½%	½%	1 %	38¼ — 38⅜ xd	38¼ — 38⅜ xd	38½	37½	..	2 11 7
2,640,914	Do. Surplus Lands	100	2½%	2½%	2½%	2½ %	66 — 68	65 — 68 xd	67½	66½	..	4 0 11
2,285,000	Do. District	100	Nil	Nil	Nil	Nil	17⅞ — 18¼	17 — 17⅞	17½	17⅜	— ⅛	Nil
891,827	Metropolitan Electric Trams., Ord.	1	..	..	4½%	..	15/16 — 1	15/16 — 1	..	..	..	6 10 11
314,016	Do. do. Defd....	1	Nil	Nil	Nil	..	3/16 — 5/16	3/16 — 5/16	..	..	..	Nil
500,000	Do. do. 5 % Cum. Pref. ..	1	5 %	5 %	5 %	..	3/4 — 7/8	3/4 — 7/8	..	..	..	5 14 3
595,600	Do. do. 4½ % Deb. Stock Red.	100	4½%	4½%	4½%	4½%	92 — 95	92 — 95	94½	..	..	4 14 9
$10,823,200	Mexico Trams Co., Common Stock	..	..	..	..	..	128 —130	130 —132	131	129½	+2	..
$9,000,000	Do. 1st Mort. 50-year 5% Gld. Bds.	..	..	..	5 %	..	94½ — 96½	94½ — 96½	96	95½	..	5 3 8
245,500	Potteries Electric Traction	1	4 %	4 %	Nil	..	1/16 — 1/8	1/16 — 1/8	..	..	..	..
245,500	Do. 5 % Cum. Pref.	1	5 %	5 %	5 %	..	1/16 — 1/8	1/16 — 1/8	..	..	..	6 17 11
245,000	Do. 4½ % Deb. Stock	100	4½%	4½%	4½%	..	84 — 87	84 — 87	..	..	..	5 3 6
87,350	Telegraph Construction and Maintenance	12	15 %	17½%	15 %	17½%	34½ — 36	34½ — 36	..	..	..	5 3 0
140,000	Do. 4 % Deb. Bds., 1 to 1,500 Red., 1909	100	4 %	4 %	4 %	4 %	99¼ —101½	99¼ —101½	..	..	..	3 18 10
1,000,000	Underground Electric Railway, 5% Prior Lien ..	..	..	..	5 %	..	101 —102	101 —102	102	101⅜	..	4 18 0
2,800,000	Do. do. 4½% Bonds	..	..	..	4½%	..	87 — 89	86 — 88	88	86⅜	—1	5 2 3
4,900,000	Do. do. 6% Income Bonds	..	..	..	..	..	33 — 35	32 — 34	33	..	—1	..
66,666	Willans & Robinson, 1 to 30,000 & 30,001 to 116,666	1	Nil	10 %	5 %	..	1/16 — 3/16	1/16 — 3/16	..	..	..	..
66,666	Do. 6 % C.P., 30,001 to 30,000 & 125,001 to 141,666	6	..	6 %	6 %	..	1½ — 2½	1½ — 2½	..	..	..	2 8 4
245,495	Do. % 1st Mort. Deb. Stock		4 %	4 %	4 %	..	72 — 77	70 — 75	70	..	—2	5 6 8

ELECTRICITY SUPPLY COMPANIES.

15,000	Bromley (Kent) E.L. & P., 1 to 15,000	5	5⅛%	5⅛%	5⅛%	..	4⅛ — 4⅜	4⅛ — 4⅜	..	..	..	5 15 9
70,000	Do. do. 4½ % 1st. deb. stock ..	100	4½%	4½%	4½%	..	91 — 94	91 — 94	..	..	..	4 18 9
80,449	Brompton & Kens. Elec. Lt. Sup., Ord., 1 to 20,000	5	10%	10 %	10 %	..	7⅛ — 7⅜	7⅛ — 7⅜	7 1/16	..	..	6 1 8
9,551	Do. do. 7 % Cum. Pref.	5	7 %	7 %	7 %	..	7⅛ — 7⅜	7⅛ — 7⅜	..	..	..	4 4 10
400,000	Central Electric Supply 4 % Guar. Deb. Stock ..	100	4 %	4 %	4 %	4 %	99 —102	99 —102	..	..	..	3 18 5
80,000	Charing Cross and Strand Electricity Supply ..	5	5 %	5 %	5 %	..	3⅝ — 4⅛	3⅝ — 4⅛	..	..	..	5 14 3
80,000	Do. do. do. 4½ % Cum. Pref.	5	4½%	4½%	4½%	..	4⅛ — 4⅜	4⅛ — 4⅜	..	..	..	4 17 4
80,000	Do. "City Undertaking" 4½ % Cum. Prf.	5	4½%	4½%	4½%	..	3⅞ — 4⅛	3⅞ — 4⅛	..	..	+ ⅛	5 5 11
445,736	Do. do. 4 % Deb. Stock Red. ..	100	4 %	4 %	4 %	4 %	96 — 99	96 — 99	77/6	..	..	4 0 10
49,486	Chelsea Electricity Supply, Ord.	5	4½%	4½%	4½%	4½%	3½ — 3⅝	3½ — 3⅝	70/-	67/6	..	6 0 0
175,000	Do. do. 4½ % Deb. Stock Red. ..	Stock	4½%	4½%	4½%	4½%	99 —101	98 —101	..	..	— ½	4 9 1
70,595	City of London Elec. Lighting, Ord. 40,001—110,595	10	6 %	6 %	6 %	6 %	10½ — 10⅞	11⅛ — 11⅜	11⅛	11	+ 1	5 2 2
40,000	Do. 6 % Cum. Pref., 1 to 40,000	10	6 %	6 %	6 %	6 %	12 — 13	12⅛ — 13⅛	..	..	+ ⅛	4 10 7
400,000	Do. 5 % Db. Stk.	Stock	5 %	5 %	5 %	5 %	120 —124	121 —125	..	..	+ 1	4 0 0
800,000	Do. 4½ % 2nd. Db. Stk.	100	4½%	4½%	4½%	4½%	99 —102	99 —102	..	..	..	4 8 3
50,000	County of Durham Electrical Power, Ord.	5	4 %	2 %	..	..	1⅝ — 2	1⅝ — 2	..	..	..	5 0 0
50,000	Do. do. do. 5 % Pref. ..	5	5 %	5 %	5 %	..	2⅞ — 3⅛	2⅞ — 3⅛	..	..	..	7 8 2
250,000	Do. do. do. 5 % 1st Mtg. Deb.	Stock	..	..	5 %	5 %	91 — 93	91 — 93	..	..	..	5 7 6
40,000	County of London Electric Lighting, Ord. 1—40,000	10	5 %	5 %	5 %	5 %	7⅛ — 8	7⅛ — 8	..	..	..	6 5 0
55,000	Do. do. 6 % Pref., 40,001—60,000	10	6 %	6 %	6 %	..	10⅜ — 11⅛	10⅜ — 11⅛	10 3/8	10 1/8	..	5 7 10
400,000	Do. do. 4½ % Deb. Stock ..	Stock	4½%	4½%	4½%	4½%	108 —106	108 —106	..	..	..	4 4 11
400,000	Do. do. 4½ % 2nd. Deb. Stock ..	Stock	4½%	4½%	4½%	..	98 —101	98 —101	..	..	..	4 9 1
80,000	Edmundson's Electric Corporation, Ord. Shares ..	5	Nil	Nil	Nil	..	1/16 — 1/8	1/16 — 1/8	2/6	..	..	Nil
80,000	Do. do. 6 % Cum. Pref.	5	3 %	Nil	Nil	..	3/16 — 1/4	3/16 — 1/4	11/6	..	..	Nil
480,500	Do. do. 4½ % 1st Mort. Deb. Stk.	100	4½%	4½%	4½%	..	60 — 63	61 — 67	..	..	+4	6 14 4
$8,150,000	Electrical Dev.Co.of Ontario, 5% 1stMtg.Gold Bnds.	$500	..	..	5 %	5 %	81 — 84	81 — 84	..	..	..	5 19 1
10,000	Folkestone, 1 to 10,000	5	5⅛%	5⅛%	5 %	..	4⅜ — 4⅞	4⅜ — 4⅞	..	..	..	5 12 10
10,000	Do. 5 % Cum. Pref., 1 to 10,000	5	5 %	5 %	5 %	..	4⅜ — 5⅛	4⅜ — 5⅛	..	..	..	4 13 0
90,000	Do. 4½ % 1st Deb. Stock	100	4½%	4½%	4½%	4½%	95 — 98	95 — 98	..	..	—2	4 11 10
15,000	Hove, 1 to 15,000	5	9 %	8⅛%	8⅛%	..	6¾ — 7⅛	6¾ — 7⅛	..	..	..	5 13 4
$1,976,000	Kaministiquia Power Co., 5 % Gold Bnds.	100	..	..	5 %	5 %	102½—104½	102½—104½	..	..	+ ½	4 15 8
21,000	Kensington and Knightsbridge Electric Ord. ..	5	10 %	10 %	8 %	..	7 — 7⅛	7 — 7⅛	7⅜	..	..	5 4 1
90,000	Do. do. do. 4 % Deben. Stk.	Stock	4 %	4 %	4 %	4 %	94½ — 9 xd	94½ — 96½	95½	..	..	4 2 11
111,000	London Electric Supply Corporation, Limited, Ord.	3	4 %	2½%	3 %	..	1½ — 2⅛	1½ — 2⅛	37/6	..	..	4 4 3
70,000	Do. do. do 6 % Pref. ..	5	6 %	6 %	6 %	..	4⅜ — 5⅛	4⅜ — 5⅛	..	..	+ ⅛	5 14 3
882,355	Do. do. 4 % 1st Mort. Deb. Stk. Red.	Stock	4½%	4½%	4 %	4 %	90 — 93	91 — 93	..	..	+ ½	5 7 6
800,000	Metropolitan Electric Supply, 1 to 100,000	5	8 %	6½%	5 %	..	4 — 4⅛	4 — 4⅛	86/3	85/-	..	5 11 1
76,121	Do. 4½ % Cum. Pref. 1—71,106	5	4½%	4½%	4½%	..	4⅝ — 5	4⅝ — 5	98/9	..	..	4 10 0
285,000	Do. 4½ % 1st Mort. Deben. Stock ..	Stock	4½%	4½%	4½%	4½%	104 —107	104 —107	..	..	..	4 4 1
248,000	Do. 5% Mort. Deben. Stock Redem.	Stock	5%	5%	5%	5%	93 — 96	88 — 96	85½	..	..	4 1 5
$6,000,000	Mexican Electric Light Co., 5% 1st Mtg. Gold Bnds	100	5 %	5 %	5 %	..	81 — 83	81 — 83	82¼	..	..	6 0 6
18,585,000	Do. Light and Power Co., Ltd., Common ..	$100	..	..	3½%	..	68 — 70	68 — 70	69⅛	69	..	5 0 0
$2,400,000	Do. do. 7% Cum. Pref. Stk.	Stock	..	..	7 %	..	101 —105	100 —104	102½	101	..	6 13 4
12,000,000	Do. do. 5% 1st Mtg. Gold Bnds,	100	..	..	5 %	5 %	88 — 90	88 — 90	89⅜	88⅜	..	5 11 1
950,000	Midland Electric Corporation, 4½ % 1st Mort. Deb.	100	4½%	4½%	4½%	4½%	96 — 98	96 — 98	..	..	..	4 11 10
130,491	Newcastle-on-Tyne, 1 to 137,500	5	8 %	8 %	2½%	..	4 — 4⅛	4 — 4⅛	..	..	..	2 15 9
137,500	Do. 5 % Pref., 1 to 137,500	5	5 %	5 %	5 %	..	4 — 4⅛	4⅛ — 5	..	..	..	5 11 1
125,500	North Metropolitan Electric Power Supply Co., 5 % Mortgages (Red.), Nos. 1 to 1,255	100	..	..	..	5 %	99 —101	99 — 101	..	..	..	4 19 0
10,853	Notting Hill Electric Lighting	10	7½%	7½%	7 %	..	12⅛ — 13⅛	12⅛ — 13⅛	..	..	..	5 6 0
90,000	Oxford, 1 to 96 and 407 to 20,310	5	7 %	7 %	..	..	6 — 6⅛	6 — 6⅛	..	..	..	5 7 8
80,000	Do. 4 % Deb. Stock	100	4 %	4 %	4 %	..	93 — 96	93 — 96	..	..	..	4 1 8
119,694	River Plate Electy. Co. Ord. Nos. 1 to 120,507	1	2½%	6 %	3 %	..	1⅛ — 1⅜	1⅛ — 1⅜	31/10½	..	..	4 18 6
100,000	Do. do. 6% Non Cum. Pref. Nos.1 to 100,000	1	6 %	6 %	6 %	..	1 15/32 — 1 17/32	1 15/32 — 1 17/32	..	..	..	5 19 0
200,000	Do. do. 6% Deb. Stk. Red. ..	100	6 %	6 %	5 %	5 %	101 —104	101 —104	..	..	..	4 16 2
40,000	St. James' and Pall Mall Electric Light, Ord. ..	5	10 %	10 %	10 %	10 %	8¾ — 9	8¾ — 9	8⅞	..	..	6 7 0
20,000	Do. do. 7 % Pref. 20,001 to 40,000	5	7 %	7 %	7 %	7 %	7 — 7⅛	7 — 7⅛	..	..	..	5 11 1
150,000	Do. do. 5½ % Deb. Stock Red. ..	100	5½%	5½%	5½%	5½%	88 — 87	88 — 87	..	..	..	4 0 6
12,000	Smithfield Markets Electric Supply, Ord.	5	Nil	Nil	Nil	..	2 — 2⅛	2 — 2⅛	49/7½	..	..	Nil
85,000	South London Electric Supply, Ord.	4	5 %	4 %	5 %	5 %	2⅜ — 2½	2⅜ — 2½	61/8	58/9	..	9 6 1
120,100	Do. do. 5 % 1st Mort. Deb.	100	..	..	5 %	5 %	100 —103	100 —103	..	..	..	..
120,000	South Met. Elec. Lt. & Power, Ord.	1	2½%	2½%	2½%	..	1/16 — 1/8	1/16 — 1/8	..	..	..	4 8 11
142,988	Do. do. 7 % Pref.	1	7 %	7 %	7 %	..	1 31/32 — 2 1/32	1 31/32 — 2 1/32	..	..	..	5 15 6
234,520	Do. do. 4½ % 1st Deb. Stk.	100	4½%	4½%	4½%	..	100 —103	100 —103	..	..	..	4 7 5
80,000	Urban Electric Supply, Ord.	5	5 %	5 %	5 %	..	1/16 — 1/8	1/16 — 1/8	..	..	..	25 6 8
60,000	Do. do. 5 % Cum. Pref.	5	5 %	5 %	5 %	..	1⅛ — 1⅜	1⅛ — 1⅜	..	..	..	14 5 4
275,000	Do. do. 4½ % 1st Mort. Db. Stk. Red.	100	4½%	4½%	4½%	..	74½ — 78½	74½ — 78½	..	..	..	5 14 8
808,000	Victoria Falls Power Co., Pref. Nos. 1 to 808,000 ..	1	..	..	5 %	..	1/16 — 1/8	1/16 — 1/8	..	..	..	5 6 8
100,000	Westminster Electric Supply, Ord.	5	12 %	10 %	10 %	10 %	8⅝ — 9⅛	8⅝ — 9⅛	8⅞	..	..	5 9 7
51,279	Do. do. 4½ % Cum. Pref. Reduced from 6% since 31st Dec., 1906)	5	4½%	4½%	4½%	4½%	4⅜ — 5⅛	4⅜ — 5⅛	5 3/32	..	..	4 3 9

* Unless otherwise stated, all shares are fully paid. † Quotations on Liverpool Stock Exchange.

Bank rate of Discount 3½% per cent., January 19th, 1910.

KITE FLYING AND OVERHEAD WIRES—AN EXTRAORDINARY ACCIDENT.

By J. W. MEARES, M.Inst.C.E.

Ever since the days of Benjamin Franklin electricity has been to some extent associated with kites in the public mind, but in India the connection is apt to be unpleasantly close at times. The reference is not to specimens of the genus Raptores, although these have at times mixed themselves up among overhead wires, but to the humble kite of tissue paper and bamboo, which is flown in great numbers by the youth of this country. Where two kites are being flown near together, it is the object of each boy so to manipulate his string as to make it cross and cut that of his rival. This game is always being played, and, to facilitate the operation, special string is prepared, run through a mixture of glue and powdered glass. Of this more anon.

Thinking to improve on this primitive method, an ingenious youngster in Calcutta substituted very thin copper wire for the first 30 or 40 ft. of his string, at the kite end, and proceeded to fly it. As he hauled it in, however, the copper wire crossed a 500-volt trolley wire of the tramway company, and presently reached the boy's hand also. Notwithstanding the resistance of the boy's (practically naked) body, the wire appears to have become red hot, and several of his fingers were burnt right off. The boy's body also became entangled in the wire, which burnt deep into the flesh before fusing or breaking off. When he was examined in hospital some of the wire was still embedded in his chest, but he is recovering.

Another accident, probably not the only one of its kind, occurred in Rangoon recently, as the result of the glass-covered cutting thread to which reference is made above. In this case a No. 10 S.W.G. bare overhead wire, part of a series street lighting circuit, broke and fell on a coolie, who, however, extricated himself. Another coolie, however, walked on to the fallen wire and was killed, the pressure being about 1,500 volts to earth. Examination showed that the wire had received mechanical injury in the form of a cut at the point of fracture, and further search revealed a number of similar cuts in other lines. It was clearly proved that these were caused by kite strings being pulled over the wires, and an experiment was made in which a No. 10 wire was completely cut through in about half an hour by drawing some 300 yards of kite string rapidly over it. The writer some ten years ago saw part of a cast-iron railing, about ½-in. square, cut through by a native workman in about three hours with no other apparatus than a piece of rough string, a handful of dust, and a little water—coupled with a great deal of patience. In the case of overhead wires, as soon as the skin of the wire receives a nick the next string will naturally catch at the same point and continue the work of destruction, just as a trolley bow tends to wear unequally from the same cause.

This account may prove interesting to the electrical profession in other parts of the world, although I believe kite cutting is a purely East Indian amusement.

THE EMULSIFICATION OF OILS IN TURBINES, CRANK CHAMBERS, &c.

By JAS. E. SOUTHCOMBE, M.Sc., F.C.S.

It is well known to all engineers that a very troublesome feature in the lubrication of turbines, forced feed and splash engines, is the tendency for the oil to emulsify with any water with which it may either accidentally or unavoidably come into contact. The chief objections to such emulsions are—

1. The thickening of the mixture due to the great increase in the oil-water surface.

2. The breaking down of the oil film when the water reaches a certain concentration.

It has been observed that the lubricating properties of the emulsion produced from any given hydro-carbon oil vary greatly from time to time, as the percentage of water contained in it increases. Samples containing 2 to 3 per cent. of water examined by the writer are perfectly mobile liquids and are satisfactory lubricants in forced-feed engines, but as soon as the water content increases above certain limits, the lubrication becomes inefficient.

In one case which the writer has recently investigated, an oil which has been in continuous use in a 5,000-H.P. turbine has taken up 3 per cent. of water, but nevertheless is acting quite satisfactorily as a lubricant, the temperature of the bearings being practically normal.

It is evident from considerations of the nature of lubrication that so long as an oil or an emulsion spreads itself readily over the surfaces of a bearing, forming a stable film which keeps the running surfaces apart, then must the lubrication be efficient. The peculiar value of oil as a lubricant depends largely upon this property of spreading itself in a thin layer over metallic surfaces, resulting from the fact that its surface tension is extremely low, while a substance like, say, water, whose surface tension is high, fails to spread over a metallic surface, but tends rather to gather itself up into globules.

Now, a microscopic examination of the emulsion in the above-mentioned case reveals the fact that the globules are not oil, as hitherto supposed, but water—*i.e.*, the emulsion is one in which water globules are suspended in oil. Again, since the surface relation of oil to water is over 97 per cent., and further, since, as we have seen above, the surface tension of oil is lower than that of water, on placing the emulsion on a metallic surface, the oil will spread itself and form a lubricating film.

If, however, the percentage of water in an emulsion is high—*i.e.*, above 7 per cent. to 10 per cent.—this spreading is prevented, since the water globules, being present in considerable number, break up the film, and so lubrication ceases.

Although the ideal case and the perfect lubricant, all things being equal, is that in which the oil remains perfectly unemulsified, nevertheless certain types of emulsion are not a serious disadvantage, and for the engineer the most important questions are: Is the oil lubricating? Is the bearing cool?

It was with the object of preventing these objectionable emulsions which are inefficient or bad lubricants that a research was instituted by the writer, working in the laboratory of the Henry Wells Oil Co., some months ago, and as the matter has recently attracted the attention of engineers and others, it appears desirable to give a brief account of the lines upon which we are working.

The cause of the emulsification of two immiscible liquids, when agitated together (*e.g.*, oil and water), has been investigated by several workers, notably Ramsden (*Proceedings* Royal Society, Vol. 72, page 156), and later Pickering (*Journal* Chemical Society, 1907, p. 2001).

The author has extended these investigations to the study of heavier and more viscous oils, such as are suitable for lubricating in turbines and forced-feed engines.

Two types of oil present themselves:—

1. Oils which readily emulsify when shaken for a short time with clear water, and which do not separate again for some time.

2. Oils which do not emulsify when shaken with water for a short time, but which commence to emulsify after some months' working in an engine.

Between these extreme classes there is a large range of oils which emulsify, and separate again more or less readily.

With regard to those oils which emulsify readily with pure water, the writer has made a prolonged series of investigations on the surface tension of the oil-water interface.

This research is at present still in progress, but the statement can now be made that a definite relation seems to exist between the emulsification property and the interfacial tension between the water and oil. The surface tension towards water of different hydro-carbon oils has been found to vary widely, and the author hopes shortly to publish further accounts of this investigation, the importance of

which, from the manufacturer's point of view in the preparation of a non-emulsifiable oil, cannot be over-estimated. If, however, instead of pure water, we are dealing with water containing suspended matter, then the tendency to emulsify is much increased.

Pickering (*loc. cit.*) has shown that when an oil is churned up with water containing almost ultra-microscopic solid particles, powerful emulsification ensues. Among the substances which he finds to be active emulsifiers are soaps, basic sulphates of copper and iron, ferrous hydroxide, lime and a variety of clays.

Now, substances of a similar nature to these are almost constantly present in turbines and all steam engines, being introduced by the steam and water, and are accountable chiefly for the so-called "breaking up" of oils with the formation of emulsions after having been in use for some time.

The writer has frequently come across emulsions and crank chamber water, which contained lime and compounds of iron in which the iron was present in the ferrous state, combined with some organic acids which were not present initially in the oil, showing that some chemical change had been brought about.

The following explanation is suggested :—

During the working of an engine there must always be minute amounts of iron and other metals produced in a very finely divided state, which are converted, by the steam, air and water, into oxides. These oxides then attack the oil, oxidising certain hydrocarbons present in it, with the formation of acids, while the oxides themselves are simultaneously reduced.

This has been proved to occur with small quantities in the laboratory, and explains the presence in some oils which have been in use for long periods of ferrous iron and organic acids, notwithstanding the fact that the original oil was free from acidity.

Now these compounds are admirable emulsifiers, a very minute amount sufficing to produce a powerful emulsion in a few minutes, and there can be no doubt that their production in a turbine or crank chamber is responsible for most of the emulsification troubles encountered.

The time required to produce these substances in sufficient quantity to materially affect the lubrication will depend upon several factors, notably :—

1. The quantity of water which comes in contact with the oil.
2. The nature of this water, *i.e.*, its content of dissolved salts and suspended matter.
3. The temperature of the oil.
4. The presence of readily oxidisable hydrocarbons in greater or less quantity in the oil.

It is probable that the reaction is responsible for the ultimate natural death of the oil in all cases, but there can be no doubt that, by preventing, as far as possible, leakage of water from the cooling coil in the oil chamber of a turbine, or priming from the boiler in the case of other engines, the period of satisfactory lubrication in the life history of an oil may be very considerably prolonged.

THE CONTRACTOR, THE MANUFACTURER AND THE SUPPLY AUTHORITY.

By E. H. FREEMAN.

The opinions which the manufacturer and the supply authority hold of the contractor have been brought forward on many occasions, and many reasons have been given in favour of exterminating that long-suffering individual. There is another side to this question, however, and possibly the views of a contractor on the manufacturer and the supply authority may not be without interest. My criticisms do not apply to every member of either class, for there are exceptions to every rule, but as regards the majority of manufacturers and supply authorities, I am sorry to say that they deserve all that I have to say about them. I should also explain that in using the word "contractor" in the following remarks, I do *not* include the odd-job man, the plumber out of work who does a little wiring to fill in time, the bell-hanger electrician and other similar classes. I refer rather to contractors of some standing who have something more to lose than the profit on any particular job if it is not done properly.

First, I would ask the manufacturers as a class whether they do not feel some responsibility for the existence of the large number of contractors who have no financial standing. Whose fault is it that any wireman out of a job can start in business without capital? Surely the existence of such a class of contractor is entirely due to their having been given credit, unjustifiably, by the manufacturer, and surely the manufacturer cannot blame anyone but himself. Personally, I think he is only reaping where he has sown when he is called in to the usual creditors' meeting.

I would ask the supply authorities also whether they can claim, with justice, to be entirely free from blame. It is the casual and useless insulation test and the entire absence of proper inspection of the installation that makes it possible for these small odd-job men to go from job to job. A regular refusal to connect up a defective installation would put an end to this class of contractor, and his continued existence is largely due to the deplorable laxity of the supply authorities. But for the limitations of space instances such as the following could be multiplied indefinitely. They have all come under the personal observation of the writer during the last year or so, and every reputable contractor could give similar instances by the score. In every case the supply authority had tested, inspected and passed the work as satisfactory, and the purchaser is usually satisfied that the work has been properly done when the supply authority has passed it.

Here are a few examples of such satisfactory work :—

1. A 7/22 wire carrying 68 carbon lamps on one circuit without any fuses, and with eight or nine joints in less than 12 ft.
2. Unprotected wires run between floors without casing or tubing.
3. A pair of live wires cut off with pliers and left unsealed and alive, with the copper quite exposed and the two conductors not ½ in. apart. More than a dozen such ends were found in one house, and had been there for months at least.
4. Flexible cord run unprotected between floors, many points being thus wired.
5. Flexible cord run in casing and tubing, again to many points in one house.
6. A main switch, fuses and *meter* fixed immediately over a large hot-water boiler, and within 3 ft. of the top of it.
7. Sub-mains and other cables insulated with rubber tape only (exactly like bell wire), and then laid up with cotton yarn to look like ordinary cables—these on 240 volts connected to the mains of a supply authority with some of the most stringent rules existing—on paper.
8. Flexible cord buried in plaster without any protection whatever.
9. A combined gas and electric light fitting wired with flexible cord threaded in and out of unbushed holes in the brass tube of the fitting—this in a large city office rewired within the last three months.

With such specimens of work before his eyes, is it to be wondered at that the reputable contractor declines to bother his head to canvass for business in districts where such work is acceptable, knowing as he does that he is wasting his time and money? He refuses to carry out such installations, and has no conceivable chance of competing with firms who will, and whose trump card is that their work will be inspected, tested and approved by the supply authority, and that it must therefore be properly done!

This, I think, is the explanation of the inefficient canvassing of which Mr. Holmes complains. He evidently refers to the smaller installations on which no consulting engineer or architect is employed. The prospective customer naturally relies on the supply authority to see that the work is carried out properly, and takes their test and approval as conclusive, and by bitter experience the contractor of repute knows the utter futility of trying to get orders under such circumstances. His energies will be spent, naturally, in

finding business in directions where only good work is tolerated, *i.e.*, amongst the larger installations of which your manufacturing contributor wrote, which are usually carried out under *unofficial* inspection. Mr. Holmes would not find any difficulty in obtaining efficient canvassing by reputable contractors if they were assured of some return for their efforts. They are all too anxious to get work to let any chance go by, but they cannot be expected to spend time and money canvassing for the benefit of the supply authority and some odd-job man whose qualifications are the magic words "Electrical Engineer" written on a sign board and a capacity to get work passed by an overworked assistant to the mains superintendent.

I should like to say a further word to your contributor in the issue of January 7th. Here again I do not think the contractor is quite the useless unnecessary individual that is indicated by the article. Reference has already been made to the responsibility of the manufacturer for the large number of contractors who are financially unsound. Their responsibility for the alleged lack of support given to reliable manufacturers is not less clear. As a class, I am sorry to say, the manufacturers of machinery show little or no consideration for the contractor. They quote the factory owner prices as low as, or lower than, those given to contractors, and they frequently do all they can to deter customers from dealing with the contractors. The contractor knows that if his price for motors is high his prospective customer will conclude that his prices for wiring, lighting, &c., are also high. Is it surprising that he sometimes quotes for a cheaper grade of machine than he would prefer to put in, to avoid losing the other business?

It must be obvious that the contractor's interests are best served if he can book the order including really first-class machines, and that it is only the stress of severe competition from the actual makers of those machines that leads him to quote for something of less high quality.

I think it will be evident to any impartial reader that the contractor is not quite as black as he is painted. There does not seem to be any reason why he should be regarded as the black sheep of the whole electrical flock, and I am sure it would be advantageous to the industry as a whole if some effort were made by all its sections to look upon one another less as deadly enemies and more as allies. This problem has been solved in America with very considerable success, and could be here if we had any body that represented the electrical industry. The Institution of Electrical Engineers should do so, of course, but apparently thinks mere matters of trade, business, finance, &c., not worthy of serious consideration. As a contractor I want the manufacturers to refuse credit to unsubstantial individuals and firms; I want the supply authorities to refuse absolutely to connect up to improperly executed installations; I want the insurance engineers to refuse to pass as sound any work not complying with the rules; I want more careful inspection of installations by Home Office and Board of Trade—in a word, I want to see some assistance given to the Contractors' Association in their efforts to raise the standard of work. Now we have no means of insisting on any such standard. If the other authorities would help us, we would gladly refuse membership to firms to which those authorities had objections on the score of financial standing or because they had been found guilty of faulty work. Membership of the Association would then imply reliability, as is now the case in America. Surely it is ridiculous that plumbers should be obliged to be registered whilst anyone, however incompetent, should be allowed to install electrical work, which may involve the most serious dangers of fire or accident. Only on the very day on which I write this, I have seen a 1-H.P. motor on 400 volts with absolutely unprotected terminals; with the wiring run in unearthed tubing, and with the motor itself not earthed, and wiring to another 400-volt motor run in wooden casing almost entirely devoid of capping—all within 100 yards of Holborn Circus, and in a building which an insurance company's inspector has visited within the last few weeks. This kind of thing is by no means uncommon; the supply authority, Home Office, Board of Trade and insurance company all prohibit it emphatically and repeatedly on paper, but ignore the most flagrant and obvious disregard of their rules. No doubt I shall be told the contractor is responsible, but my contention is that no one who would do such work should be allowed to call himself a contractor, and that he can style himself as such now is only possible because of the gross neglect of their duties by members of other sections of the industry.

NOTES ON TRAMWAY OVERHEAD EQUIPMENT.

By H. DUDGEON.

(*Concluded from page* 193.)

CROSSINGS, on the other hand, are generally a source of trouble when they are of a smaller angle than about 20°. There are, however, some good automatic arrangements on the market that overcome the difficulty.

Fig. 2 shows a simple double-suspension junction where narrow-angled frogs are used. As in fig. 1, it will be noticed that the wire is arranged relative to the track so that the side-travel of the trolley wheels, and therefore the subsequent wear on the wire, will be as little as possible.

The arrangement of the wire at a junction, whether a simple or complicated one, will depend, to a great extent, on local circumstances. It is very easy to "plant" poles in ideal positions on paper, but often a very different thing to find room for them in equally suitable spots between the

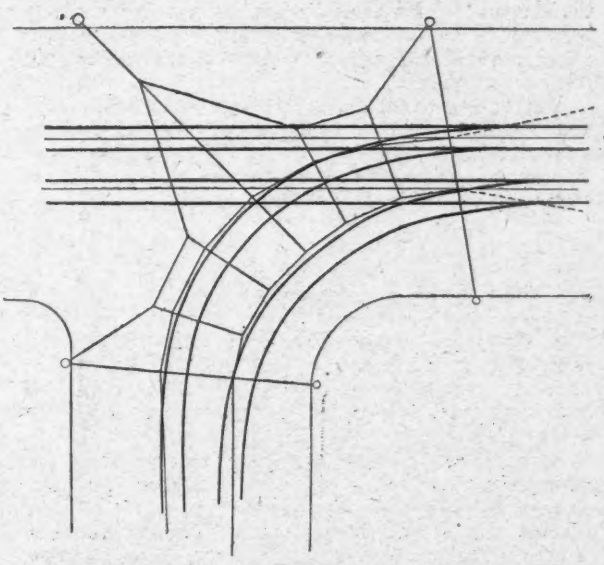


FIG. 2.

many pipes and cables under City pavements. But even where the poles happen to be in awkward places, a little ingenuity in arranging the span wire will generally provide a satisfactory trolley path. Although it is always good policy to set out the work so as to be as sightly as possible, it must be borne in mind that smooth running does not necessarily follow from a pretty, symmetrical arrangement of the span wires. The ambition should be to keep the angles enclosed by the trolley wire at all points as large as we can and, by means of well-designed fittings, to eliminate the bumps and jars, and thus make the proper path of the trolley wheels as enticing as possible.

Clear of junctions and curves, the amount of trouble and wear varies very much with the fittings used. Non-fouling *versus* fouling ears, sweated *versus* mechanical ears, galvanised *versus* bronze hangers, porcelain *versus* composition insulators, &c., are old controversies, and although the future of an overhead system depends to a great extent on such details, it is curious how opinions differ as to what is best. Such differences are most satisfactorily settled by practical experiment.

The use of grooved sections of trolley wire has clearly

demonstrated that a perfectly non-fouling ear is the best means of suspension. But "grooved," it must be remembered, is only a comparative term, and there are plenty of sections on which it is impossible to fix ears that do not foul the wheels. With such sections, it has been found that the cost of continually renewing the ears is greater than if sweated ears were used, and the likelihood of the wire stripping from the latter at any time is less remote. Grooved wire, however, has brought troubles of its own. Its chief fault is its tendency to twist on its side, and it is not uncommon in a long span to find it twist through 180° and back again. This twisting is detrimental both to the life of the wire and the trolley wheels, and on light curves the ears at single pull-offs are sometimes twisted dangerously on their sides.

That soldering trolley wire does not damage it can be easily proved by trying it on some scrap wire. But the best proof is that hundreds of miles of wire have been suspended in this country by sweated ears, and the greater portion is wearing—or has worn already—naturally to the scrap heap. That some of it has given trouble by breaking at the ends of the ears proves either that the wire itself or the workmen's method of soldering was defective. This is hardly surprising when we consider the haste in which some of the lines were erected, and remember that the chief qualification of many linesmen at that time was a slouch hat, a woollen sweater and a big belt, and that the proper use of solder and such things were only minor considerations. Nowadays, there are few linesmen who would pour red-hot solder on trolley wire under the impression that they were soldering it.

The absurdity of putting gun-metal hangers on galvanised span wire is demonstrated nearly every day on any large system in a manufacturing district. Any factor of safety originally possessed by the span wire is a constantly diminishing quantity, owing to the local action, and in the course of two or three years it generally vanishes altogether, when the span wire is renewed and the same cycle started again. It is safe to say that if plumbers and gas-fitters had to do with this branch of wiring, and were responsible for the innovation of this practice, that gun-metal hangers would be a thing of the past. Galvanised malleable iron hangers have proved the most suitable from an electrical point of view; that they are strong enough for their purpose can be proved by a testing machine. However, the best proof is the fact that they have been used for years on several systems, and have given entire satisfaction. The same can be said of porcelain as a pole insulator.

Section insulators usually require a good deal of attention, and, if neglected, very soon prove troublesome. They should never be erected on curves unless pull-off spans are run at either side to take off the horizontal strain produced by the angle made by the trolley wire. Insulators with wooden "top sticks" are seldom satisfactory, owing to the tendency of the wood to warp and shrink, and cause the other parts of the insulator to assume unruly shapes. With air-gap section insulators the gaps need not be more than a quarter of an inch wide, and preferably of the herring-bone pattern; if they are much wider than this the jumping of the trolley wheels leads to premature destruction. If wooden runners are used for gap pieces, there is no excuse for allowing them to get into such an uneven state as to cause the trolley wheels to be thrown off. But this can be said of the majority of faults that develop on overhead work, and whether they are allowed to develop far enough to provide a call-out for the repair wagon depends very much on the inspection linesman who looks after the work In this respect a pessimistic individual, who will "meet trouble halfway," is to be preferred to the cheerful fellow who sees that a thing is worn badly, but reasons that, as it was much the same the last time he inspected it, it will be safe to postpone repairs till his next trip.

The small springs used on frogs are seldom touched, until, having broken or become too weak, the tower wagon is called to them. These springs cost only a few pence, and and it will be found a much better plan to renew them periodically, even if the old ones are apparently good. Frog pull-wires, where they bend round the small pulleys at the tops of the poles, also get very little attention usually except when they break. Another such item is the $\frac{3}{8}$-in. bolts in the clevis end of globe insulators. The swaying of the wires and fittings causes them to get worn, and in the course of two or three years, they will generally be found dangerously thin. It is curious that strong pole straps and $\frac{5}{8}$-in. bolts are usually found at the pole end of a span, when a globe insulator is necessary, while a $\frac{3}{8}$-in. bolt is put to do the same duty at the trolley wire end.

There are, of course, several faults that arise and over which the linesmen have no control. A trolley wire breaking inside the end of a fitting, for instance, can hardly be foretold. But if the wire before erection had to pass a severe "vibration" test, as suggested by Mr. P. S. Sheardown a few years ago, and the fittings in no way nicked or damaged the wire, then the chances of it breaking would be greatly reduced.

Side-feeder cables, especially when they get a little old, are inclined to burn out and cause no end of trouble and delay if there is no system in vogue for quickly locating such faults. It is wise to test these cables periodically, and I know of several cases where this has been the direct means of saving burn-outs; I recall one instance in which the first test revealed an open circuit in a cable inside the pole.

Lightning arresters, too, are often stowed away in section boxes and forgotten. The connections are apt to work loose, and the thin wires of the coils to perish, and under such circumstances it is not surprising when the lightning comes along that it sometimes plays nasty tricks.

In conclusion, I would like to suggest that all overhead work be periodically tested for faults likely to cause the trolley wheels to leave the wire. The B. of T. demands that all insulation be tested once a month; but apparently—on some systems at least—any cranky arrangement of faulty frogs and things is good enough from a mechanical point of view. But a trolley standard being pulled over on the top of a car or a live wire falling in a crowded street is just as much to be dreaded as anything that might accrue through faulty insulation, and such accidents are not unlikely when a trolley pole runs amok among the overhead work. A special car run round every month or so at an extra speed, or at the ordinary speed with a considerably reduced tension on the trolley pole and a well-worn wobbly trolley wheel, would show up at once any dangerous shortcomings. The test could be made as stringent as desired, and the overhead work brought to such a perfect state as to render very remote the chance of a pole leaving the wires under ordinary working conditions.

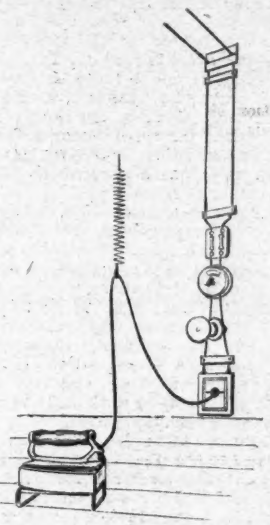
ELECTRIC FLAT IRONS.

By F. B.

In a lecture before the Fire Insurance Club, of Chicago, recently, Mr. B. E. Blanchard referred to the precautions necessary in the use of electric flat irons. The number of irons in use has increased very rapidly, and it is satisfactory to note that the number of fires resulting therefrom has not increased materially. One of the risks attaching to their use is that there is often nothing to indicate whether the current is on them or not. By the nature of its work an iron is prevented from overheating when in use, as it is constantly giving up its heat to the articles operated upon. If left with the current on, however, it may overheat and give rise to fire-risk. Various means have been suggested with a view to obviating this risk, but nothing quite satisfactory has yet been evolved. Irons with small lever switches fixed to them, and others with spring switches which are closed by gripping the handle have been marketed, but as the author referred to points out, such arrangements do not accomplish their purpose as the user ties them down to get rid of the inconvenience.

It is recommended by the underwriters' laboratories that each iron should be controlled by an indicating switch, and that a low candle-power light should be installed near to the switch so that one can see at a glance whether the current

"on" or "off." Irons should be provided with pull-out plugs, says the same authority, so that should one fall on the



Arrangement of Pull-out Plug to Safeguard Iron.

floor it will break the circuit. The illustration shows the suggested arrangement.

THE FUNCTIONS OF THE INSTITUTION OF ELECTRICAL ENGINEERS.

We have received from Mr. E. Garcke a copy of the correspondence which has taken place between him and the secretary of the Institution of Electrical Engineers, which we reproduce below:—

The Institution of Electrical Engineers,
92, Victoria Street, London, W.C.,
January 28th, 1910.

E. Garcke, Esq.,
Electrical Federation Offices,
Kingsway, W.C.

Dear Sir,—In reply to your letter of December 10th last, I am instructed by the Council to inform you that their administration of the affairs of the Institution of Electrical Engineers is governed by its memorandum of association.

The main object of the Institution is to promote the general advancement of electrical and telegraphic science and its applications. The Council have always given, and will continue to give, as broad an interpretation to the memorandum of association as is consistent with the avoidance of matters which, while possibly affecting one section of the industry beneficially, might be injurious to the interests of another section or contrary to the public interest.

The Council are constantly engaged in the consideration of matters affecting the industry which come within the proper scope of the objects of the Institution; and in regard to legislation, they have always welcomed applications from Government Departments for advice or assistance, and have repeatedly taken the initiative in putting before such Departments the views which they may have formed on questions connected with the general advancement of the industry.

Accounts of the Council's action in regard to these matters appear in due course in the annual reports of the Institution. The particular matter to which you refer in your letter will be dealt with in the next report.

I am, yours faithfully,
(Sgd.) P. F. Rowell, *Secretary*.

P. F. Rowell, Esq., *February 3rd*, 1919.
Secretary,
Institution of Electrical Engineers,
92, Victoria Street, S.W.

Dear Sir, — I have received your esteemed letter of January 28th, for which I am much obliged. I am aware that the administration of the affairs of the Institution of Electrical Engineers is governed by the memorandum of association of the Institution, and it was because of the irreconcilable statements which had been made as to the province of the Institution in regard to legislative and commercial matters, that I ventured to ask the Council to make a pronouncement on the subject.

You refer me to the Annual Reports of the Council for information as to the action of the Council in regard to these matters, and an examination of these Reports for the past 22 years (since I have had the honour of being a member of the Institution) clearly shows that the Council have, as you state, given a broad interpretation to the memorandum of association. During this period the Council have given their attention to such purely legislative and industrial matters as the London Building Acts (Amendment) Bill, 1905; the Workmen's Compensation Bill, 1906; the Factory and Workshops' Act, 1901; and to other kindred questions.

In regard to some of these matters the Council, it appears from the Reports, have taken the initiative.

In March, 1901, the Council appointed a committee on electrical legislation—

"To determine whether they can recommend the Council to take any action, and if so, what action, that would assist the industry in connection with the matters dealt with in Mr. Madgen's paper on the Electrical Power Bills of 1900."

According to the report issued by the Institution the Committee found—

"That the essential difference between the electrical industry as it exists in the United Kingdom, and as it exists abroad, is largely due to the exceptional legislative enactments, official regulations, and powers of local authorities, existing in this country."

And the report adds—

"Thus, British electrical engineers, capitalists and others concerned have been hampered by enactments and rules which other Governments have regarded as either unnecessary or opposed to public interests.

"The Committee considers that the Acts restricting the electric industry should be revised in order that there may be that development which is necessary to the commercial progress of the nation."

As a result of the finding of this Special Committee of the Institution, the Council arranged for a deputation to wait on the President of the Board of Trade with a view to obtaining amelioration of the legislative conditions surrounding the electrical industry.

Moreover, in 1903, the Council appointed a Parliamentary and Industrial Committee—

"To collect information, consider and report to the Council on proposed legislation, regulations, enactments and policy, so far as they may be expected to affect electrical industries generally from the engineering point of view, and to make recommendations to the Council as to the advisability of taking action thereon or otherwise."

It cannot, therefore, be said that the Council of the Institution have felt that their action in regard to legislative or commercial matters has in any way been circumscribed by the memorandum of association, or that it was not in the view of the Council the province of the Institution to undertake the protection of the industry in legislative and commercial matters.

With regard to the necessity or expediency of discriminating between conflicting interests of the various sections of the electrical industry, I do not believe that any member of the Institution entertains the slightest doubt that the Institution possesses the ability and the means of equitably safeguarding these sectional interests while promoting the general legislative and commercial welfare of the entire industry, provided the Council act in their representative character and avail themselves of the exceptional facilities at their command for forming impartial judgments on the position and requirements of the industry from commercial as well as technical aspects.

The points I desire to emphasise are:—

1. That no industry of the magnitude and importance which the electrical industry has now attained can permanently subsist in this country with adequate advantage to British capital and labour unless it possesses an authoritative, representative and efficient organisation for the promotion and protection of its general legislative, industrial and commercial interests.

2. That the electrical industry in this country does not possess such an organisation. It possesses several most praiseworthy societies for the furtherance of sectional interests, but apart from the Institution of Electrical Engineers, there is no organisation in the country which is able to represent the industry as a whole, and this correspondence, although it has brought out the fact that the Institution has the power to meet this much-felt want, and that the Council has occasionally exercised this power, still leaves it open whether the Institution may be relied on to provide an organisation as above defined.

3. The Council of the Institution having from time to time given their attention to certain legislative and commercial questions, many members have formed the belief that the Institution does in fact, in all cases, protect the legislative and commercial interests of the industry in a manner rendering any other efforts with this view unnecessary.

4. At the same time many members, including myself, are of opinion that the Council have not dealt with legislative and commercial matters in such a manner as to offer reasonable hope of preventing the industry from being very seriously prejudiced relatively to other industries and interests in this country.

In support of this expression of opinion, I would point out that in 1902 the then President of the Board of Trade informed the deputation from the Institution that a Bill would be introduced to give effect to the recommendations of the Joint Select Committee of both Houses of Parliament which sat in 1898; but the subsequent annual reports of the Council contain no reference to any efforts that may have been made by the Council to get this official promise realised. I have in my previous letter referred also to what I most respectfully consider the neglect to deal properly with the Electric Lighting Bill of last session, and you are good enough to inform me that this matter will be dealt with in the next annual report; but may I be permitted to point out that the Bill was passed substantially in its objectionable form by the House of Lords in May last, before the presentation of the last annual report of the Council, which, however, contained no reference whatever to the

Bill. If it had not been for the efforts subsequently made by a few members without the benefit of the great influence of the Institution the Bill would, it is believed, have become law in a form which would undoubtedly have put an end to the profitable investment of capital in many provincial electric lighting undertakings.

There can be no doubt that the commercial applications of electricity have, in quite an exceptional degree, been made the subject in this country of misguided and empirical legislation, greatly to the detriment of those who are engaged in the industry, and that a very large proportion of the capital which is employed in the industry is consequently less remunerative than similar investments in other countries. If any support were needed for this statement, I would only refer you to the full and authoritative report of the influential and representative committee appointed by the Council in 1901.

While I have felt constrained to express myself strongly and unequivocally in regard to the attitude of the Institution in commercial matters, I hope I have done so without in any way detracting from the feelings of respect for the governing body of the Institution which I share with all its members, nor without failing to recognise and gratefully appreciate the considerable, the excellent and the beneficial work which the Institution has done for the industry in engineering and technical matters, and incidentally also the important services which have consequently been rendered to many other industries and interests in the country. But no one who feels any responsibility for any part of the capital invested, or for the material welfare of those who are engaged in the industry, can avoid the conclusion that it is regrettable that an Institution which is capable of such excellent work and which enjoys a thoroughly representative character and possesses the requisite influence and means, has not devoted a larger portion of its energies to the promotion and protection of the commercial prosperity of the industries which it represents, and I am quite sure that I am but expressing the feelings of a large number of the members of the Institution in saying that the Council would render the industry an inestimable service if they would at this juncture provide for the electrical industries in this country, the much needed organisation to be constituted either entirely within the Institution, or partly within and partly outside the Institution, so that steps may be taken with a view to improving the general industrial conditions under which electrical undertakers, manufacturers, and contractors are working.

May I, in conclusion, express the hope that the Council will announce their views on this all-important and pressing matter at as early a date as they can conveniently do so.

I am, yours faithfully,

(Sgd.) E. GARCKE.

PROCEEDINGS OF INSTITUTIONS.

Equitable Charges for Tramway Supply.

(*Discussion on paper by* MR. H. E. YERBURY, *at the* INSTITUTION OF ELECTRICAL ENGINEERS, *January 26th*, 1910.)

MR. A. J. CRIDGE, in opening the discussion, said that if in Sheffield the tramways and electric supply undertakings had been combined, and if the profit which the tramways department had given to the relief of rates had been applied to the betterment of the financial position of the joint undertaking (the reduction of the enormous over-capitalisation of the electric supply department), it would have been better for the ratepayers as a whole. Cheap power and cheap tram rides promoted employment and trade in the city, and were as great a boon as low rates. The Corporation's undertakings were really one business, and every effort should be used to make all parts of it financially sound before frittering money away in the relief of rates. The author suggested that the charges to tramways departments were usually too high, and in the case of combined stations he thought that was often the case. The peaks on the two kinds of load did not occur at the same time. The effect of a tramway supply would be to flatten out the load, and thus to conduce to economy in running. It would be possible for the electric supply department to supply 13,000,000 units, at 2,000 volts, two-phase, at the Kelham Island switchboard at ·55d. per unit. When the Sheffield undertaking was purchased by the Corporation, a large sum was paid for goodwill and other non-tangible assets. If, by investing new capital, that new capital could be made to yield a profitable return, it was a business proposition so to invest it. It was not fair to charge later consumers upon capital which was of no value for the purposes of their supply. Mr. Yerbury said that a tramways undertaking should only be debited with the capital charges incurred on its behalf; he applied that proposition to the sale of electricity for power, and would like to apply it to new lighting consumers too. He agreed with most of the points in the summary, but thought the suggested profit of 3 to 5 per cent. on running charges alone was very small. Surplus funds should not be devoted to the relief of the rates, but kept available for the betterment of the business.

MR. R. L. ACLAND (Chesterfield) said it was very desirable that some equitable basis of charging tramways departments should be arrived at. He thought that some of the figures in the paper applied very much more to the larger undertakings where the load factors were a good deal higher than in some of the smaller systems, such as the one under his charge at Chesterfield, where the top tramway load came right on the top of the lighting load, and thus considerably reduced the station load factor. He found that the load factor of the stationary motors came out at about 13 per cent., and that of the tramways was only about 14 per cent. Taking the author's figures for the calculation of the price to be charged, he found that it worked out, in his case, at 1·1d. per unit, as against 1·25d. per unit, which was the amount charged by the lighting department to the tramways department. On small undertakings the curves were very much more "peaky" than those given in the paper.

MR. R. MARSH said that a few months before Mr. Yerbury decided to give this paper, the Municipal Tramways Association, and the Municipal Electrical Association, arranged for a conference on this question. A correspondent of the ELECTRICAL REVIEW dealt at length with this subject, but whether it would be a help or a hindrance in arriving at an equitable charge, remained to be seen. Recently the Local Government Board had reduced the time for the payment of loans from 30 to 20 years, so that after 20 years' time all the extensions they were at present putting in would be absolutely free of debt. Regarding the wages and salaries of the staff at a power station, that were charged to the units generated, he pointed out that the members of the staff were often employed on other work that would be done by other employés in a separate tramway station.

MR. I. F. FAWCETT said: Regarding the profits the author suggested, it seemed to him that the fixed charges would come to a considerable amount as compared to the running costs, and if they fixed the profits at 3 or 5 per cent. on the running costs, they would really only be paying 1½ to 2 per cent. on the total cost. As they had to install a certain amount of plant to meet the tramway load, he did not think that the profit of 3 or 5 per cent. on the running costs would give a fair margin of profit. The figures given in the tables varied to an enormous extent, and there did not seem to be any just reason for this variation.

COUNCILLOR FENTON (Sheffield) said it was a question whether some of the people who used light were not paying for some of the deficiencies of the cheap power users. Mr. Cridge suggested that they should not put on these power charges the amount due to the old capital. But if not on the power consumers, why on the private users of electric light? The low cost at Kelham Island Station reflected the greatest possible credit on Mr. Yerbury, as it was obtained with old reciprocating engines. It seemed an extraordinary thing in places like Manchester and Bradford that they should charge such a high price per unit to the tramways department as compared with what they charged to the private users. Regarding Mr. Cridge's offer to supply the tramways at ·55d. per unit, he did not think it would pay the department to take it even at that price.

MR. WARDALE agreed with Councillor Fenton that the lighting people had the tramway people fast, and they knew there were profits to be made. The proposition was unsound that because one department was making profit it should help another on. The power charges had to be kept down simply to compete with large private plant and the gas engine; and if the supply was not practically given away some people would not take it. Regarding the capital which Mr. Cridge alluded to, it was their own fault for making a bad bargain. It was hardly fair to make the old consumers, who helped them in the early days when they were building up the load, and who had stood by them, pay these heavy charges. It would not pay the tramways to take current at ·55d. per unit, because they were generating cheaper themselves.

MR. H. DICKINSON (Leeds) said the author stated that the maximum-demand principle was the fairest system of charging, and that the majority of municipal supply tariffs were based on this system, whereby all consumers were supplied on the same terms. They did not supply all consumers on the same terms; certain classes of consumers were charged on the same terms. The author claimed preferential treatment for the tramways department. It was cheaper to provide for power load than for a lighting load of the same load factor, as the former was a practically known load from day to day, but with the lighting load they had to provide for the fluctuating peaks which might come on at any time. No one had defined what was an equitable charge for lighting. Surely it was legitimate to charge what a consumer was prepared to pay, taking into consideration the competition with other illuminants; there was no doubt at all that supply undertakings got a higher price and a higher profit for lighting than they did for power, for the simple reason that there was less competition in lighting. A person having a private plant could not, generally speaking, produce for himself so advantageously for lighting as for power, on account of the very fluctuating load and poor load factor for lighting as compared with power. They were perfectly justified in charging the lighting user a higher price, because they could get it, and competition governed the price they could obtain. He did not suggest that the author's figures or contentions were not correct; he believed that in certain cases the supply authorities were charging a high price for their supply to tramway authorities, but that was only part of the argument, and a very good case could be made out for the lighting people who were charging the high price, because they were able to develop a power business that was of benefit to the town. It tended to bring people to the town where the cheap power supply was, and he maintained that ultimately the combined station would be able to produce at a cheaper rate because of the power business—cheaper than the tramway undertaking could supply itself. Under these conditions, if the lighting authorities charged the higher price, it made no difference, for the money had not gone out of the Corporation's pockets; the town had got the profit either in the

lighting or the tramways department, and it had also got this large power business, which should be of great benefit to the town. He did not think it was fair to say that the tramway load was anything like a non-fluctuating load.

Mr. W. N. Y. King (communicated): Considering the fact that a high load factor and a demand for a large number of units conduced to the cheap production of electrical energy, it was reasonable to expect that a tramways system (of any but the smallest size) should be charged on the lowest scale existing in any case, for it compared more favourably than any ordinary lighting or power consumer in respect of these two items. However, from the tables given, this did not seem to be the case. Comparing the 17 systems mentioned with one another in respect of the excess of the price per unit charged to tramways over the total works costs, they vary between very wide limits, and in some cases the excess, which, presumably, is to supply interest, sinking fund and depreciation, is so great that it does not appear to be equitable, to a consumer who brings the advantages of high load factor, large total demand, and simple metering and book-keeping.

Mr. W. M. Rogerson said he agreed in the main with the author; there was no doubt that a large number of towns were overcharged in the tramways department. In a number of towns electric lighting came first, and small generating stations were put down in the centre of the town; in such cases the works cost in a combined station could not compete with a tramways station pure and simple, put down probably some six or seven years later. After all, even if the works cost was high in a combined station, that could, of course, be charged to the tramways department *pro rata* to other customers. In Halifax they charged at a fairly low rate—$1\frac{1}{16}$d. per unit. They also had a power charge varying according to the number of units consumed per horse-power per quarter from 2d. down to $\frac{3}{4}$d. per unit; they compared these charges with the then tramway charges, and found that the actual price charged for tramway purposes was less than it would have been had the charge been at their ordinary power rates. Last year the average price they would have charged on their own scale to the tramways would have been 1$\frac{1}{4}$d. per unit. In February, 1908, the borough accountant and himself went into this matter of charges, and suggested practically the same method that Mr. Yerbury adopted in his paper—that was to say, they separated the capital charges which were distinctly applicable to either tramways or lighting. Then they found out the demand on each system and the capital charges which were common to both—such as buildings, plant, &c., and divided the cost of these *pro rata* to the demand, and took the works costs as they then stood, plus interest and sinking fund *pro rata* to the capital outlay as estimated for each undertaking, and they found that if they charged in that manner the charge for tramways supply would be 1·32d. per unit, taking simply the works costs as a running charge, as against $1\frac{1}{16}$d., the actual price paid. The tramways were a valuable asset to a purely lighting station. He congratulated the author on his load curve. In Halifax the gradients were very heavy, and the hills made a big difference, as well as the number of cars per mile, which considerably affected the load factor. The load factor on the lighting and power supply was a trifle higher than on the tramway supply, so that taking the price on the load factor the electricity department ought to be receiving rather less per unit on the average for lighting and power than for tramway purposes. As a matter of fact, their average price obtained came out at 1·8d. per unit for lighting and power, while for tramways it was $1\frac{1}{16}$d. per unit. He would like to see some arrangement come to between the Municipal Tramways and the Municipal Electrical Associations with regard to these charges.

Mr. H. E. Yerbury, in reply, said Mr. Cridge practically admitted that his power consumers were not charged a proportion of the capital expenditure on the entire undertaking, but only on the plant installed at the new station. This policy undoubtedly brought in additional revenue, but it appeared to him to be hardly fair to many consumers who got no reduction in price per unit, although the generating costs had been reduced more than half by the acquisition of this power load. With respect to the offer to supply at ·55d. per unit, it would not pay them to accept it, as they would have to install high-tension apparatus and transforming plant, the loss on which would be approximately 20 per cent., which would certainly bring the figure to more than their total costs of 659d. per unit. Mr. Marsh mentioned the point which Mr. Pearce took up recently in the Electrical Review where he criticised the Sheffield figures and brought them up to ·81d. as the total cost for traction units. He (the author) pointed out at Manchester that the particulars he got from the department were erroneous, for the reason that they generated and used about 150,000 units at the power station for boosting purposes; these units were strictly chargeable to traffic for traction purposes, and if these units were added to the units which were debited only to the cars it would reduce that ·81d. to ·75d. including income-tax and all his other charges. In Manchester and also in Bradford the percentage of profit determined by the supply department was 3 per cent. only on their works costs, which brought in a return of approximately £1,000 per annum. He agreed with Mr. Wardale that if the tariff were revised, old lighting consumers should have the preference and not the new consumers as mentioned by Mr. Cridge. The text of Mr. Dickinson's comments appeared to be "get all you can." It was a very businesslike policy; he failed to see why there should be such a great difference between the respective customers. Stalybridge charged no less than 170 per cent. above their total works costs to the tramways department. In Halifax the tramways department was debited with 10·5 per cent. in excess of the total works costs. He suggested that there was not that great difference in interest and sinking fund charges between these two places to cause the great difference in selling price. The maximum demand was determined by the maximum peak load, and he suggested 25 per cent. spare plant as against an average of 33 per cent. now in combined stations. With regard to the suggested profit of 3 per cent. to 5 per cent., he contended that where over half a million units per annum were required by a tramways department, they should not pay more than 1d. per unit. If they in Sheffield had paid the same amount as Bradford or Manchester, or even 1d. per unit, there would have been nothing to hand over in relief of rates, and in some years a loss would have been entailed, whereas during the last 10 years, notwithstanding low fares, the contributions to rates from the tramways department had been over £14,000 per annum.

Discussion at Manchester, January 25th.

Mr. S. L. Pearce said the question of charges for tramway supply was about to receive the attention of a Joint Committee in London, composed of municipal electrical engineers and municipal tramway managers, and it was to be hoped that some solution of this somewhat knotty question might be forthcoming. Some little time ago many of them might have seen an editorial article in the Electrical Review which gave rise to a good deal of discussion, and amongst others, he contributed three or four letters to that paper. What he had to say might, to some extent, be rather a repetition of matter contained in that correspondence. He ventured to think that the author made one very serious mistake in supposing that the costs as declared by self-contained undertakings which were published in the "Standard Form of Tramway Accounts" were necessarily correct, and that the charges made in combined undertakings invariably erred against traction. Mr. Yerbury drew attention to the variable practice obtaining in different towns as regarded the apportionment of some of the capital charges; he omitted to point out, however, that in a good many of the cases direct low-pressure current delivered from the sub-stations within a few yards of the tramway routes was being compared in cost with an alternating high-pressure current metered at the generating station busbars, and that before any allowance was made either for works consumption or for losses in transmission, conversion and distribution. To compare cases on an unequal footing like that was perfectly absurd. In Table V the author was not fair, because he was comparing towns in which, owing to the different systems of supply, sweeping adjustments must be made before an equitable comparison could be made. The item for rates and rents in connection with the distributing system was, in some cases, charged against the tramway general operating costs. Again, differences of policy with regard to depreciation made an enormous difference in the accounts, or in the actual costs of production. Where the provision was on a liberal scale, this amount could under the standard form be treated not as a cost but purely as an appropriation of profits, and in consequence it did not figure in the actual cost or price per unit. In the case of combined undertakings, the due proportions of such amounts as the above were all merged in the charges against the tramways departments, and were of sheer necessity part of the price quoted per unit. He found that Mr. Yerbury had drawn pretty largely on the tables compiled by the *Electrical Times*, and other information he had drawn from "Garcke's Manual of Electrical Undertakings." He hardly expected Mr. Yerbury to take these figures and to put them forward as he had done, which was certainly a most misleading course. He was inclined to think that Mr. Yerbury had not much idea of the labour involved in putting the figures on a sufficiently common basis to make them of any real value. In the case of Manchester, his department tried to get their figures down on to a comparable basis with both Sheffield and Glasgow, and the work found necessary would deter anyone from generalising on the mere strength of published data, seeing that the bases of those data were invariably dissimilar. Taking Sheffield, the published figure was ·668d. per unit generated. From that figure was omitted all question of rates on ducts and cable work. They omitted income-tax, and, finally, there was an adjustment to be made for additional units lost in transmission, as compared with the loss on the Manchester city feeders. The net result, after bringing the Sheffield figures up to the same basis as Manchester's, was to increase Mr. Yerbury's figure of ·668d. to 81d. Manchester's figure for the central area of the city, which was strictly comparable with Sheffield—the low-tension portion supplied from their Bloom Street city works—was ·88d. per unit generated. But Sheffield had an output of 13$\frac{1}{2}$ million units, and a load factor of 38 per cent.; the Bloom Street portion of the Manchester output was only 8 million units, and the load factor only 28 per cent. He was content, under the differing load conditions, to give Mr. Yerbury the benefit of the difference in his favour, viz., ·07d. per unit. He was very surprised not to find any reference to Glasgow. If Glasgow had been introduced, it would have shown that "the costs of separate traction stations are not invariably lower than the prices charged by combined undertakings." The Glasgow undertaking was the only one which could be fairly compared with Manchester; the systems were identical, and the outputs were pretty well the same. After going into the comparisons very carefully, the net result went to show that Glasgow's figure was 1·24d. per unit as against the Manchester figure of 1·04d.—since reduced to 1d. The Manchester flat rate of 1d. per unit compared exceedingly favourably with Glasgow, or any other similar undertaking. Mr. Yerbury's assumption that traction business always compared very favourably with industrial power business might be disposed of by contrasting Manchester's traction load factor of 33 per cent. with the load factor obtained at their Stuart Street station, viz., 50 per

cent. The latter included traction supply, lighting and industrial power supply. He estimated the load factor of the industrial power supply alone as being between 60 per cent. and 70 per cent. in their case—surely a sound justification for charging rates below 1d. per unit to large power users. Mr. Yerbury's recording ammeter sheets were really wonderful curves. It was a very fine traction load, very constant and steady, but he did not think it was typical of traction loads throughout the country. At Bloom Street, Manchester, the morning and evening peaks were very accentuated. If there were high peaks on any traction system, he submitted that the whole of Mr. Yerbury's argument on this question of apportioning some of the charges for coal, repairs, wages, &c., to standing costs fell to the ground. When he spoke about fixed charges he included standing charges, plus capital charges. Standing charges were the portion of the works operating costs which were incurred independently of the station output, but dependent on the station maximum demand. He could not agree, therefore, with Mr. Yerbury that no portion of the coal, oil, wages, &c., items should be debited to standing charges. The allocation of these items between running and standing charges was a matter for argument. In the case of those combined undertakings, where the capital charges were pooled, and the tramways department paid a share in the proportion to the total that their maximum demand bore to the total maximum demand of the undertaking, it was clear that they were getting a benefit from the lower priced extension plant installed for purposes other than traction, to which they were not strictly entitled. He thought Mr. Yerbury was altogether too sanguine in estimating the annual percentage necessary to cover depreciation and obsolescence. He took the figure of 1·75, and that figure gave an equated life of 34 years. He thought that was altogether too long. The lives adopted by the Municipal Electrical Association, which agreed very closely with the findings of many other experts, worked out at an equated figure of 22 years. Mr. Yerbury, in the suggested allocation of expenditure, put all repairs to running charges. Here he was against the general weight of opinion, which favoured some portion being placed to standing charges, as all repairs were not consequent on the actual energy produced. The members would agree that Mr. Yerbury might make out an excellent case for uniformity of method of charging to be adopted, but it would not be by any generally proved iniquities in present-day conditions of charging.

MR J. R. SALTER agreed with the remark in the paper that bulk supply to tramways effected a general reduction in the generating costs, but the supply authority did not take this advantage into consideration at all. There were many lighting undertakings in this country whose profit, and in some cases their existence, depended upon the tramways supply; but he knew of no tramway whose existence depended upon an electric lighting supply. In all cases of tramway supplies the supply was given at the switchboard, whilst for power and lighting it was given at the consumers' terminals. The electricity undertaking, therefore, bore the whole of the cost of transmission losses in a power supply, but charged the tramway undertaking in the case of tramway supply. In any comparison of charges there should be added to the tramway charges a percentage equal to the losses on the power and lighting network. It was known that electricity undertakings frequently supplied current for power purposes under cost, because of the extraneous advantages which that supply gave, and there appeared to be no justification for ignoring the claims of a tramway supply to similar treatment on the same ground. Too much was made of load factor, and too little consideration given to the quantity supplied. In a case with which he was associated which had an output of 68,000 units per annum, the generating costs were 4·19d. per unit. A tramway supply was afterwards added, which increased the output to about 700,000 units, and the generating costs were reduced to 1·23d. The station, which had previously been unable to take on any power supply at all, had now been enabled, owing entirely to the tramway load, to supply power consumers at ¾d. per unit, yet when fixing the charges for a tramway supply, it was in some cases insisted upon to divide the fixed costs proportionately to the maximum demand. In another case with which he was connected, the maximum demand charges were such that they limited the number of cars that could be put on the line. For running five or six more cars on a Bank Holiday, he would probably have to pay hundreds of pounds a year, although the plant was quite available, and doing nothing.

MR. C. C. AITCHISON said the author had stated that the lighting load lasted on an average three hours a day, but he did not say anything about the power load. He did not give the lighting the possibility of having any power load on it. The statement in connection with keeping boilers under steam for peak loads was from his own experience incorrect.

MR. C. L. E. STEWART agreed with Mr. Salter that tramway undertakings helped the electricity undertakings, especially in their initial days, because at that time they had no custom whatever. If they could make sure of a certain fixed income, it enabled them to make a bid for business which they otherwise could not do at all.

MR. MILES WALKER thought something should be said about power factor. A tramway department having modern plant and taking current at unity power factor ought to receive more favourable terms than a tramway department taking current at 0·8 power factor. A power factor of 0·8 called for 25 per cent. increase in K.V.A., which meant that the generating plant and cables were increased in like ratio. The total capital would increase about 8½ per cent. The capital costs were more than half the total costs, so that the total costs of generation, including capital charges, would be increased by about 4½ per cent. Something must also be allowed for efficiency, which, in generation and distribution, due to a lagging power factor of 0·8, would average 1½ per cent. This, added to the 4½ per cent., gave 6 per cent. as a fair concession to make to users at unity power factor.

MR. F. H. WHYSALL said the general conclusion he had come to on the discussion was that everybody looked at the matter in the first place from his own standpoint, and the whole business was tied up for want of a common basis of comparison. With separate traction stations, the conditions with regard to arriving at costs per unit were very largely in the hands of the people managing the station. In combined undertakings, where current was sold to another department, or to a company, the people who bought the current had to be satisfied that the charge was just, and it seemed a very different thing doing that to deciding what to put down as a departmental figure.

MR. S. J. WATSON said Mr Yerbury's proposal for dividing up the cost into running and standing charges, although correct so far as the tramway station was concerned, was certainly not so when it was put forward in regard to the combined stations. He suggested that the whole of the coal, oil, water, wages and repairs were the running costs; they were nothing of the sort. The only running cost was a portion of the coal, oil and water, a trifle of the wages, and some portion of the repairs. On the smaller systems there was a tremendous variation in the tramway load. In his own case the mean load of the plant was only about one-third of the full-load capacity. A power load was practically a steady load, and the plant used to supply that power was running at absolutely top load all the time, so that they must get very much more economical results. He agreed with the author that the tramways department should pay for the cost of the feeder cables and stand the loss which took place in them, but in regard to the maintenance, he thought that in many cases, on smaller systems, the electricity department should repair the feeder cables at the cost of the tramways department. In his experience they had actually obtained the maximum tramway load on top of the peak load. He was very largely with the author in some of his remarks in the summary. With regard to the manner of quoting the management costs, rates and taxes, and general establishment charges of that kind, in the first place, he took all his rates and taxes, management, salaries and office costs, and off that amount he took all that he could think of which was attributable to the making-out of individual consumers' accounts; then off what was left he took a percentage based on the relative value of the mains and the substations. He took the mains from what was left; then from what was left again he took out the proportion for each maximum demand for lighting and power, and the maximum demand for tramways. He thought this was a very fair way of dealing with this particular item. The principal difficulty, he thought, in bringing the tramway demand into line was in regard to capital expenditure.

MR. C. E. C. SHAWFIELD (Wolverhampton) said that the tramway load factor was not anything like so good as it was supposed to be. In his case the number of cars run in the daytime was 25, whereas towards the evening, more particularly in the winter, the number was increased to 40 or 45, when the peak load of other consumers was on. Moreover, at that time every car was well loaded and stopped at every stopping place. In 1901 the speaker, in installing generating plant, buildings, cables, &c., to meet the requirements of the Tramways Committee, had to pay nearly £100 per KW. when purchasing by tender in the open market. During the last two years he had laid down a new power station for three-phase E.H.T. supply, in which the capital cost per KW. of building, boilers, generating plant and cables came out to almost exactly £20 per KW., and the average full-load steam consumption to about 18 lb. per KW.-hour. It was obviously unfair, therefore, to compare the price charged for tramway supply with the prices charged to private consumers of motive power unless due regard was also taken to the marked difference in the cost of supply. The price he charged for tramway supply of about 1½ million units per annum was 1·125d. per unit. When the Sheffield output was only some 1½ million units the cost of supply from a separate generating station was about 1·25d.

MR. YERBURY, in reply to Mr. Pearce, said that the apparently high percentage of power taken in the Sheffield Tramway Works included booster units, which, strictly speaking, should be chargeable to traffic for traction purposes, and the figure obtained and made use of by Mr. Pearce, viz.:—·81d. as a total cost for Sheffield, was erroneous. If the 150,000 units taken annually by boosters were included in traction units, then his ·81d. was reduced to ·75d., which figure included *all* rates and taxes on ducts and cables, income-tax, and also his high estimate of 12 per cent. loss in transmission. He found on taking an average of the 14 systems included in the tables generating over 2 million units per annum, that an addition of no less than 63 per cent. above total works costs, including management, rent, rates and taxes was charged to tramway departments. It appeared to him that "tariff reform" was applicable in such cases! He was strongly of opinion that tramway departments should not be burdened with capital charges incidental to the plant and high service charges connected with general supply departments, for it was well known that an ordinary service cost from £8 to £10, and large services nearly £20, so that, assuming there were, say, 3,000 to 4,000 consumers, a capital expenditure of over £40,000 might be entailed, and it was, in his opinion, unfair to expect tramway departments to pay the standing charges on this expenditure. According to the statement of the manager of the Manchester tramways at the M.T.A. meeting, the standing charges per KW. debited to the tramways department amounted to about £12 (nearly 1d. per unit), whereas in self-contained systems, say, Leeds and Glasgow, with their high-tension plant, they amounted to £4 1s. 3d. and £3 5s. 5d. respectively, which equalled ·40d. per unit on the

D.C. traction side. Assuming that fixed charges were based only on plant required for tramway supply, there was no reason why a combined undertaking should not supply electrical energy to tramway departments at the same price as they themselves could generate it at, and this should leave a fair margin of profit. If, on the other hand, the fixed charges incidental to the entire undertaking were debited to a tramway department in proportion to their requirements in kilowatts, then he had no hesitation in saying that tramways would be more economically run as entirely self-contained undertakings. It was difficult to bring into absolute line the comparative data respecting combined and separate undertakings, for variations were apparent in interest and sinking fund obligations: 2 per cent. Glasgow, 2¾ per cent. Manchester, 3·13 per cent. Sheffield; depreciation and renewals account: 4·8 per cent. Glasgow, 1·68 per cent. Manchester, 1·75 per cent. Sheffield; rates and taxes, &c.: Glasgow 1·5 per cent., Manchester ·92 per cent., Sheffield 1·15 per cent. It was well known that the spare plant in combined undertakings averaged 33 per cent. to 34 per cent., and he suggested that this percentage of spare plant was not required in self-contained systems, and that tramway departments should not be rated on the average capital expenditure per kilowatt for combined systems. In a low-tension tramway station 10 per cent. as a maximum might be stated to cover the difference between gross output and units taken by cars and feeders, whereas in a combined undertaking, if transformation was necessary, a loss of at least 20 per cent. might be expected; that was, say, 14 per cent. in conversion and 6 per cent. on the D.C. side. But in the case of Leeds and Glasgow tramway stations, where high-tension plant was installed, the total costs from the D.C. side of the stations (net output) only amounted to ·798d. per unit, which figure included proportion of taxes, insurance and general management. The percentage of management charges in combined undertakings, together with salaries and wages of running and maintenance staff, usually amounted to between 30 per cent. and 35 per cent. of total generation and distribution costs, presumably due to the salaries of collectors and clerical staff, and quantity of printing required, whereas in separate tramway departments these charges only amounted to about 20 per cent. of the total cost, and he contended that tramway departments should not be charged *pro rata* with the general supply department, but only on a predetermined proportion to be agreed upon, based on the kilowatt capacity of tramway plant. Assuming that a profit of 3 to 5 per cent. was made by the supply departments, which might be considered equitable in municipal undertakings, he contended that in no case where over half a million units was required by tramway departments should the total charge be more than 1d. per unit with coal at 15s. per ton, and where millions of units were taken, from ·8d. to ·9d. appeared to him to be reasonable, and a profitable price to charge. If they in Sheffield had paid the same price per unit as the Manchester or Bradford departments, there would have been nothing to hand over to the relief of rates, and in some years a loss would have been entailed, whereas during the past 10 years the average relief of rates by the Sheffield tramways amounted to over £14,000 per annum. Mr. Aitchison spoke of the matter from a municipal standpoint only. He would have nothing to say against the high charges if the profits were handed over to the rates, but he found the profits from lighting departments were not handed over to the relief of the rates, but very often kept on putting down plant for power purposes and charging less than their works cost. He agreed with Mr. Watson that feeders should be charged to the tramways departments, but his suggestion that they should be maintained by the electric supply department he could not agree with. He was very pleased to hear Mr. Watson go into the question of taking off certain costs which were applicable to lighting consumers, and that he also deducted mains expenses before deciding what price should be charged to the tramway departments. He found that, in the 14 systems mentioned in the table, the ratio of the price charged to their total works costs varied considerably. At Stalybridge it was 170 per cent. in excess of their total works costs; at Dundee they charged a reasonable 9 per cent. over and above their total works costs. The average worked out at 63 per cent. above total works costs chargeable to tramways departments.

An Improved Method of Electroplating.

This was the subject of a paper read before the Society of Arts on Wednesday, February 2nd, by Mr Augustus Rosenberg, Prof. Silvanus Thompson, F.R.S., being in the chair. The paper describes what is essentially a domestic method of electroplating, in which deposits of such metals as gold, silver, nickel, tin, &c., are thrown down on metal surfaces by merely rubbing these with a paste made of a prepared powder, without the necessity for using any external source of electric current, and requiring, therefore, neither dynamos, baths, solutions, nor electrodes.

The *rationale* of Mr. Rosenberg's ingenious process is very simple. His plating powders are compounded of: First, some form (whether elementary or combined) of the metal to be deposited; secondly, an uncombined electro-positive metal, usually magnesium, but sometimes aluminium, zinc or cadmium, in a highly divided state of division; thirdly, a substance capable of producing an aqueous electrolyte when brought into contact with moisture—this ingredient is only necessary when the metal to be deposited is present in the metallic state; and lastly, certain inert substances such as chalk, soapstone, kieselguhr, boracic acid, dextrine, &c., whose function it is to act partly as diluents, to prevent premature too rapid action, and partly as polishing materials.

It is clear that if a mixture of the above ingredients is moistened and rubbed over a clean metallic surface, an innumerable number of infinitesimal voltaic cells will be produced, and while the electro-positive metal present—the magnesium, for example—will go into solution as anode, the metal of the salt present will be deposited on the surface under treatment, which acts as cathode, and as the paste is rapidly rubbed over the whole surface of the plate, a continuous metallic coating will be electrodeposited in the literal sense of the term. The following simple experiment may be made as an illustration. Rub a mixture of magnesium powder (2 parts), and powdered nickel ammonium sulphate (20 parts), with a moist rag over a copper penny. This will immediately become coated with a bright film of nickel.

Further, to illustrate the reactions, take the mixture recommended for the deposition of zinc:—Zinc dust, 15 parts; ammonium sulphate, 5 parts; magnesium, 1 part; chalk, 10 parts; soapstone, 2·5 parts. In this case it is advisable to use the zinc in the metallic form, and both magnesium and zinc will go into solution electrolytically forming their respective sulphates, while zinc will immediately be thrown out of solution again, as the action proceeds, and deposited on the cathode, namely, the object under treatment. The function of the soapstone in this instance is to prevent the mixture from absorbing moisture if exposed to the air. The chalk is useful both as diluent and as a polishing agent. It is further useful as a source of alkalinity, which, just as in ordinary plating, may be valuable in improving the colour and quality of the deposit. The object to be plated has to be reasonably clean and free from grease, but the operation itself involves both mechanical and chemical cleansing, and hence the great precautions taken to clean the work in ordinary electroplating can be dispensed with in the new process. At the same time, the brighter and more highly polished the surface to be plated the brighter will be the deposit thrown down.

The plating powders are being placed on the market under the name of "Galvanit." At present only silver, nickel and tin mixtures can be obtained; but the list is to be extended, and will include alloys like brass and gun-metal, which, it is stated, can be plated with ease. It appears that the mixtures if kept in a fairly dry place do not deteriorate with time on account of local chemical action being set up; this is prevented partly by the presence of the inert substances referred to previously, and partly by coating the magnesium powder with a thin film of paraffin or resin, by immersing it in a volatile solution of these substances. The friction involved in the plating process is sufficient to remove the insulating films from the magnesium when that is no longer required.

FOREIGN AND COLONIAL TARIFFS ON ELECTRICAL GOODS.

NEWFOUNDLAND.

Every invoice of goods imported into Newfoundland must be certified in writing as correct by the person, firm, or corporation selling or consigning the goods, and must truly show the whole and actual value of the goods, in the currency of the country whence the goods have been exported directly to Newfoundland, and the quality and description of such goods, and the marks and numbers on the packages, in such a manner as to indicate truly the quantities and values of the articles comprised in each exportation package, all of which packages shall be legibly marked and numbered on the outside, when of such a character as to enable such marks and numbers to be placed thereon. A declaration must be made in the following form:—

Declaration prescribed to be made by an owner or exporter, not resident in this colony, of any goods shipped to Newfoundland on consignment, before the collector or the Mayor or other chief municipal officer at the place in the United Kingdom or other place in His Majesty's possessions abroad, from whence the goods are shipped, or before a notary public, and at any other place before any British Consul, or if there is no British Consul, before a Foreign Consul, duly accredited by any established Government, and resident in the country from whence the said goods are exported to Newfoundland.

I of do solemnly and truly declare that I am the owner of the goods shipped on consignment to at in Newfoundland, and described in the annexed invoice, that the said is a complete and true invoice of all the goods included in this shipment; that the said goods are properly described in the said invoice; that there is included and specified in the said invoice the true value of all cartons, cases, boxes and coverings of any kind, and all charges and expenses incident to placing the said goods in condition packed ready for shipment to Newfoundland; if prior to their shipment to Newfoundland the said goods or any of them have been sold to any person, or firm, or corporation in Newfoundland that there is truly set forth in the said invoice the price or amount actually charged or intended to be charged to such person, or firm, or corporation, for the said goods as in condition packed ready for shipment at the place whence *bonâ fide* exported, and consigned to the importer in Newfoundland (after deducting only such ocean freight, from place of shipment direct to Newfoundland, and Newfoundland import duties and charges as have been included in the price of the goods sold as aforesaid); if prior to their shipment to Newfoundland the said goods, or any of them, have not been sold to any person, or

firm, or corporation in Newfoundland; that the said invoice contains a just and faithful valuation of such goods at their fair market value when sold for home consumption in the principal markets of the country whence the same are exported directly to Newfoundland, and that such fair market value is the price at which the said goods are freely offered for sale in like quantity and conditions by me or my dealers therein to purchasers in said markets in the ordinary course of trade at the usual credit without any discount or deduction for cash, or on account of any drawback or bounty, or on account of any royalty actually payable thereon, or payable thereon when sold for home consumption, but not payable when exported, or on account of the exportation thereof, or any special consideration whatever; or that if the value for duty of any goods as stated in this invoice is other than the value thereof as above specified, such value for duty has, to the best of my knowledge and belief, been fixed and determined under the authority of the Customs Act at the value stated in the said invoice; and that no different invoice or account thereof has been or will be furnished to any one by me or on my behalf.

Declared before me at
this day of , 19 .

If invoices are made out at lower prices, for goods exported directly to Newfoundland, than the fair market value thereof when sold for home consumption at the time and place when and from which they were exported, there must be clearly shown in a special column, or in addition thereto, the fair market value of the goods described therein, as required by the Customs Act.

(To be continued.)

NEW PATENTS APPLIED FOR, 1910.

(NOT YET PUBLISHED.)

Compiled expressly for this journal by Messrs. W. P. Thompson & Co., Electrical Patent Agents, 285, High Holborn, London, W.C., and at Liverpool and Bradford, to whom all inquiries should be addressed.

1,735. "Improvements in thermo-electric batteries." J. Baker. January 24th.

1,768. "Compensating-winding for polyphase commutator machines with drum armatures." Akt.-Ges. Brown, Boveri et Cie. (Date applied for under Sec. 91 of the Act, June 18th, 1909, being date of application in Germany.) January 24th. (Complete.)

1,782. "Improvements in connection with mercury vapour lamps." W. C. Heraeus G.m.b.H. (Date applied for under Sec. 91 of the Act, June 23rd, 1909, being date of application in Germany.) January 24th. (Complete.)

1,794. "Improved method of and means for suspending telephonic microphones in combination with a breast plate." V. Tardieu. January 24th. (Complete.)

1,811. "Commutatorless continuous-current dynamo and motor." J. R. Wade. January 25th.

1,813. "Improvements in or relating to the fitting of electric filament lamps." C. Terry, A. E. Terry and A. V. Terry. January 25th.

1,843. "Interlocking device for regulating switches and the like." H. C. J. Fox, O. Lattin and Drake & Gorham, Ltd. January 25th.

1,883. "Improvements in electro-therapeutic apparatus." M. G. McElhinney. January 25th. (Complete.)

1,888. "Improvements relating to electric lamp fittings." R. H. Best and S. W. Hamlyn. January 25th.

1,893. "Improvements in and connected with distributors for electric accumulator-ignition gear." F. R. Simms. January 25th.

1,946. "Improvements in or relating to automatic telephone exchanges for double-wire telephone systems." G. A. Betulander. January 26th. (Complete.)

1,963. "Direct-current static generator." J. W. Ludgate, E. Knox, J. C. Knox, J. T. Daxon, J. Daxon and S. Daxon. January 26th.

2,002. "Improvements in and relating to the electro-deposition of metals." J. A. Corey. January 26th. (Complete.)

2,031. "Improvements in and relating to bearings for the spindles of electric measuring instruments." British Thomson-Houston Co., Ltd., and C. R. D'Arcy. January 26th. (Complete.)

2,032. "Improvements in electrolytic cells." J. R. Crocker. January 26th. (Complete.)

2,057. "Improvements in telephone switching apparatus." W. Aitken and British Insulated and Helsby Cables, Ltd. January 27th. (Complete.)

2,060. "Improvements in the application of electric light to certain articles." P. C. Pace, A. E. Lamkin and L. Hunter. January 27th.

2,088. "Improvements relating to the electric lighting of railway carriages and other vehicles." Electric and Ordnance Accessories Co., Ltd., and W. Seal. January 27th.

2,097. "Improvements in and relating to current-limiting devices." British Continental Electricity Co., Ltd. (W. A. Brodie, Italy.) January 27th.

2,153. "New or improved apparatus for registering telephone calls." G. H. Ward. January 28th.

2,156. "Improvements in and relating to electrically-operated percussive tools specially applicable to rock drills." R. S. Crawford. January 28th.

2,187. "Appliances (wearing) for the production and circulation between different parts of the body of mild electric or galvanic currents for the relief and cure of rheumatic, gouty, nervous and other disorders." J. J. R. Short and E. Short. January 28th.

2,201. "Improved protector for electric incandescent lamps." W. H. Dallimore. January 28th.

2,216. "Improvements in or relating to ignition devices for internal-combustion engines." C. L. Fortescue. January 28th.

2,231. "Improvement in the electrical driving of rotary paper printing presses." H. V. James. January 29th.

2,286. "New or improved electrical vapouriser." P. Blum. January 29th. (Complete.)

2,300. "Improvements in and relating to electric dry batteries." G. Fuller, G. J. A. Fuller and L. Fuller, trading as J. C. Fuller & Son. January 29th.

2,304. "Improvements relating to wireless telegraphy." F. W. Stanley. January 29th.

2,311. "Improvements in and relating to cable boxes." J. Herbing. (Date applied for under Sec. 91 of the Act, February 8th, 1909, being date of application in Germany.) January 19th. (Complete.)

2,315. "Improvements in electric clocks." C. Haunz. January 29th.

PUBLISHED SPECIFICATIONS.

Copies of any of the Specifications in the following list may be obtained of Messrs. W. P. Thompson & Co., 285, High Holborn, W.C., and at Liverpool and Bradford; price, post free, 9d. (in stamps).

1909.

Manufacture of Electric Incandescent Metal-Filament Lamps. Hirst and Wolfram (Tungsten) Metal-Filament Lamps, Ltd. 142. January 4th.

Electric Coupling. J. H. Drysdale. 194. January 4th.

Make-and-Break Devices for Electrical Purposes. H. W. Sanderson. 272. January 5th.

Thermo-Electric Pyrometers. W. C. Peake and Cambridge Scientific Instrument Co. 370. January 7th.

Electric Motors especially Applicable for Driving Sewing-Machines and the like. W. E. Lake. (F. Bissel Co.) 768. January 12th.

Arc Lamps. P. Hanisch and Regina Bogenlampenfabrik. 1,813. January 25th.

Rent-Collecting Means for Telephone Service. R. Yearneau. 1,896. January 26th.

Systems of Controlling Electric Motors for Regulating the Speed of Ships' Screws, Ventilating Fans, and the like. Siemens Bros. Dynamo Works. (Siemens Schuckertwerke Ges.) 2,176. January 29th.

Electric Traction Systems. B. D. Fox and Railless Electric Traction Co. 2,933. February 6th.

Electric Tumbler Switches. J. B. Belcher. 3,130. February 9th.

Apparatus for Electrolytically Cleaning and Bleaching Wool or other Animal or Vegetable Fibres, and also Fabrics, Tissues and the like. A. Dassonville. 3,200. February 9th.

Electrical Torsiometer. A. Denny and C. H. Johnson. 3,814. February 16th.

Electrical Switches. J. H. Tucker. 3,877. February 17th.

Electric Switches for Telephonic and other purposes. W. Aitken. 4,178. February 20th.

Electric Insulators. P. Rutzky. 6,161. March 15th.

Electrodes for Arc Lamps. G. Senftner. 8,150. April 5th. (Date applied for under International Convention, April 14th, 1908.)

Method of Producing the Electrodes of Arc Lamps. G. Senftner. 8,151. April 5th. (Date applied for under International Convention, December 17th, 1908.)

Apparatus for Wireless Telegraphy. G. Marconi and Marconi's Wireless Telegraph Co. 8,581. April 8th. (Application for Patent of Addition to 17,505/1908.)

Apparatus for Wireless Telegraphy. Marconi's Wireless Telegraph Co. and H. J. Round. 11,544. May 15th.

Electric Alarm Clocks. W. Schröder. 13,523. June 9th.

Electrolytic Apparatus having a Liquid Anode. O. Schott and C. Z. Gen. 14,288 June 18th. (Date applied for under International Convention, June 26th, 1908.)

Metallic Fittings for Electric Continuity Systems. G. Clarkson. 14,582. June 22nd.

Telephonic Sub-station Switching Systems. W. Aitken and British Insulated and Helsby Cables, Ltd. 16,643. June 21th.

Electroplating Baths. B. J. B. Mills. (A. van Winkle.) 16,931. July 20th.

Recording Devices especially Applicable for Use with Measuring Instruments. British Thomson-Houston Co. (General Electric Co.) 17,763. July 30th.

Electric Switches. C. Zee. 18,012. August 4th.

Electrical Device for Lighting Gas-Burners and the like. F. F. Dier and M. Primeau. 18,680. August 13th.

Controller Operating Handles for Electric Cars. E. K. Hofmann. 20,378. September 6th. (Date applied for under International Convention, April 8th, 1909.)

Electric Switches. G. C. Lundberg and P. A. Lundberg and A. P. Lundberg. 23,896. October 7th.

Collectors for Electricity for Overhead Conductor Traction Systems. W. Kohler. 25,348. November 13th. (Date applied for under International Convention, May 3rd, 1909.)

Harrison Ainslie's Electric Pumping Plant.—At the recent annual meeting of Messrs. Harrison Ainslie & Co., Ltd., Sir Owen R. Slacke, the chairman, in referring to the failure of the electrical pumps, said the actual cash expenditure which could be directly charged against the electrical pumping plant was only about £17,000, but to these figures must be added the loss of eighteen months to two years, and, most important of all, the cost of repairing and driving anew the levels, the collapse of which was probably due, to a great extent, to the repeated rise and fall of the water in the mines. In the opinion of the company's engineers, if the water had been pumped out uninterruptedly, the state of the mines would have been better, as soon as they had drained off, than they were then after months of hard work and the expenditure of several thousands upon them. All this fully demonstrated the loss incurred by the failure of the electrical plant. He was, however, pleased to inform them that the plant was, and had for some time been, working well, but still required certain technical alterations. Ten new electrical pumps had been purchased, seven of which were now working, and three had yet to be delivered. Two of the pumps used in emptying the mines had been sold, as they were no longer required by the company. They had therefore no reason to anticipate any further exceptional trouble or expense in the working of this important plant, and the failure might be regarded as having been only temporary, and much in the nature of the troubles invariably attached to the installation of a large plant. Experience in other mines had shown that electrical power, when thoroughly established, was by far the best and the most economical. The original installation of a very large pumping plant—and he believed theirs was the largest plant, at any rate, in the United Kingdom—was invariably attended with many unforeseen difficulties, which frequently occasioned dispute between the installing company and their contractors. This had occurred in their case, and at the moment there was an arbitration pending between the makers of the electrical plant and the syndicate with whom they had contracted for the erection of the plant. The syndicate had, however, agreed that the result of that arbitration should be binding as between the syndicate and this company, thus preventing the company being involved in any litigation.